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12. SHIPHOLD FUMIGATION

12.1 GENERAL

NOTE: Shipboard fumigation is regulated by U.S. Coast Guard Regulation 46 CFR 147A.

Not all types of ships are suitable to carry cargo under fumigation. The following directions for use are applicable only to cargo vessels and tankers where there are no crew quarters above the cargo holds.

1. Prior to fumigating a vessel for in-transit cargo fumigation, the master of the vessel or his representative, and the fumigator must determine whether the vessel is suitably designed and configured so as to allow for safe occupancy by the ship's crew throughout the duration of the fumigation.

If it is determined that the design and configuration of the vessel does not allow for safe occupancy by the ship's crew throughout the duration of the fumigation, then the vessel will not be fumigated unless all crew members are removed from the vessel. The crew members will not be allowed to re-occupy the vessel until the vessel has been properly aerated and a determination has been made by the master of the vessel and the fumigator that the vessel is safe for occupancy.

2. The person responsible for the fumigation must notify the master of the vessel, or his representative, of the requirements relating to personal protection equipment, *detection equipment and that a person qualified in the use of this equipment must accompany the vessel with cargo under fumigation. Emergency procedures, cargo ventilation, periodic monitoring and inspections, and first aid measures must be discussed with and understood by the master of the vessel or his representative.

3. During the fumigation or until a manned vessel leaves port or the cargo is aerated, the person in charge of the fumigation shall insure that a qualified person using gas or vapor detection equipment tests spaces adjacent to spaces containing fumigated cargo and all regularly occupied spaces for fumigant leakage.

If leakage of the fumigant is detected, the person in charge of the fumigation shall take action to correct the leakage, or shall inform the master of the vessel, or his representative, of the leakage so that corrective action can be taken.

4. If the fumigation is not completed and vessel aerated before the manned vessel leaves port, the person in charge of the vessel shall insure that the appropriate protection equipment and detection devices, and a person qualified in their operation be on board the vessel during the voyage.

*Personal protection equipment means a respirator or gas mask fitted with a canister designed for phosphine gas which is approved by NIOSH/MSHA. A gas mask and canister is approved for use up to 15 ppm. Above 15 ppm or at unknown concentrations a SCBA or its equivalent must be used.

12.2 PREPARATION

1. The fumigation must be under the direct supervision of a professional fumigator trained in shipboard application.
2. The fumigator in charge must determine, either by a personal inspection or through the services of a marine chemist or surveyor, that the vessel can be fumigated without apparent hazard to the crew. It may be necessary to meet with the Engineering Officer and review the mechanical drawings of the vessel regarding specific features (e.g. the presence or absence of smoke detection equipment).
3. If it is determined that there could be a definite safety hazard that cannot be overcome, then the fumigator will refuse to proceed. He will fill out a "Refusal to Fumigate Form" and forward a copy to the corporate office in Raleigh, N.C.
4. Should the prefumigation inspection confirm that the vessel or portions thereof can be fumigated without apparent hazard to the crew, a prefumigation meeting is to be convened with the Captain and/or his designated officers. At this meeting, the ranking ship's officer, FGIS inspector (if appropriate) and elevator operator will each be given:
 - (a) An executed copy of the "Statement of Vessel Suitability for Fumigation and Fumigant Application Compliance" (to be signed by Fumigator in Charge).
 - (b) An executed copy of the "Prefumigation Notice" (to be signed by Officer in Charge of Vessel and Fumigator in Charge).

- (c) A copy of the "Precautions During Voyage Notice."
- (d) A copy of the registered FUMITOXIN® fumigant label. Copies of (a), (b), and (c) are available in Arabic, Chinese, Dutch, French, German, Greek, Japanese, Norwegian, Polish, Russian, or Spanish. The fumigator will provide the vessel representative with such foreign language copies as appropriate.

5. The fumigator shall discuss each aspect of the fumigation with the ship's designated officers explaining very carefully and fully:
 - (a) Labeling
 - (b) Symptoms of hydrogen phosphide poisoning
 - (c) Emergency first aid treatment
 - (d) Application procedures
 - (e) Required exposure time
 - (f) How to abort the fumigation (if it becomes necessary)
 - (g) Precautions to be observed during voyage
 - (h) Aeration procedures
 - (i) Proper use of personal respiratory protection (fumigator shall ascertain that two (2) full face gas masks and phosphine canisters or self-contained breathing apparatus are on board and that at least two (2) crew members know how to use them).
 - (j) Proper use of gas detection equipment — Two (2) such devices with appropriate testing tubes for phosphine must be left on board and at least two (2) crew members must be trained to use them.

12.3 APPLICATION

The fumigator shall:

1. Ascertain that all openings leading from the spaces to be fumigated (except cargo hatch covers) are sealed.
2. Determine cubic content of each hold to be treated. Wing tanks must be included in cubic content calculations unless they are to remain empty and are sealed off from the main holds.
3. Make sure that all fumigant needed is brought on board and the cases are opened ready for use. The fumigant must not be left unattended at any time.
4. Commence fumigant application only after the loading of a hold has been completed.
5. Apply the fumigant to bulk commodities at a dosage of 30-60 tablets or 165-300 pellets per 1,000 cubic feet of hold space. The fumigant should be applied uniformly across the commodity or be probed beneath the surface. Probing is strongly recommended as this helps to delay and reduce gas loss from the headspace over the grain should high winds or leakage around the hatch covers be encountered at sea.

Apply the fumigant to bagged commodities at a dosage rate of 30-60 tablets or 100-300 pellets per 1,000 cubic feet of hold space. Be sure the fumigant is attached to a substantial support, and in the case of processed foods or feeds, be sure neither the fumigant, or its residue come into contact with the commodity.

6. Close the hatch covers immediately after application is completed. Post DANGER signs on hatch covers and on all other entrances to the fumigated holds.
7. Hold a post fumigation meeting with the Captain and/or Mate of the vessel. At this time the fumigator will re-emphasize all precautions to be observed in-transit, including the monitoring of all occupied areas for possible gas leakage. The Captain will also be requested to see that following the unloading of the fumigated cargo, all warning signs will be removed and destroyed.
8. Complete a "Post Fumigation Notice" and forward one copy of all documents to PESTCON SYSTEMS, INC.

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D. SPECIMEN COPIES OF REQUIRED SHIPBOARD FORMS

PRECAUTIONS DURING VOYAGE NOTICE

SUGGESTED MINIMUM PRECAUTIONS DURING VOYAGE:

Generally speaking, crew members are free to move about the vessel during the voyage but the following minimum precautions should be observed:

- a) Do not enter fumigated holds.
- b) Should an odor of hydrogen phosphide be detected or suspected in an occupied area of the vessel, evacuate the area and check for the presence of hydrogen phosphide using appropriate respiratory protection equipment and a gas testing device. These items are on board and the Captain or his designated representative is familiar with their use. Should a leak be found, seal it with tape or caulking on the exterior side of the space under fumigation. Wear respiratory protection during this operation.
- c) Do not open fumigated holds to commence aeration until a few hours before the vessel is ready to unload. If the vessel is equipped with power ventilators, these should be turned on to assist in the aeration process. Do not enter holds during aeration process until a gas reading taken over the grain surface indicates that it is safe to do so.

SUGGESTED MINIMUM PRECAUTIONS TO BE OBSERVED DURING DISCHARGE OF THE CARGO:

Hydrogen phosphide in the air space above the grain in the holds will readily dissipate when the hatches are opened. There may be some gas remaining below the surface of the grain which will disappear as discharge continues.

However, should it be necessary for workers to enter fumigated holds to unload the grain, test the air directly above the grain in the vicinity of where the men will be working. Should gas be detected, remove workers and allow additional time for aeration.

Copy - Captain of the Vessel Copy - Elevator Copy _____
Copy - FGIS Copy - Applicator Copy _____

TO: PERSON IN CHARGE OF _____
(Name of Vessel)

You are hereby notified that FUMITOXIN fumigant will be used to treat grain in holds _____, _____, _____, _____, _____, _____, _____, _____, _____, between the hours of _____ and _____ on _____, 19____.

In accordance with Federal Regulations the following information is provided:

- a) The EPA registered FUMITOXIN label and labelling for shipboard fumigation of grain are attached.
- b) The symptoms of exposure to hydrogen phosphide (phosphine) are: Sensation of cold, fatigue, pain and tightness in upper chest, nausea, diarrhea, stomach cramps, loss of equilibrium. Severe poisoning results in cyanosis, agitation, ataxia, and unconsciousness.
- c) Emergency first aid treatment for inhalation of the gas is: Remove victim to fresh air. Make him lie down and keep him warm. Treat as for shock. Call a physician as soon as possible. Make no antidotal use of fats, oils, butter, or milk. The following measures are suggested for use by the physician in accordance with his own judgment: Should patient suffer from vomiting or increased blood sugar, appropriate solutions should be administered. Treatment with oxygen breathing equipment is recommended as is the administration of a cardiac stimulant. In cases of severe poisoning where pulmonary edema is observed, steroid therapy should be considered and close medical supervision is recommended. Blood transfusions may also be necessary. Bed rest is recommended for a minimum of 48 hours.
- d) Personal respiratory protection for two men and gas testing equipment must be on board, and at least two crew members must be familiar with its use.
- e) The threshold limit value for phosphine in spaces that are considered safe for occupancy is 0.3 ppm (parts per million).

I hereby acknowledge receipt of the following documents:

1. PREFUMIGATION NOTICE
2. STATEMENT OF VESSEL SUITABILITY FOR FUMIGATION AND FUMIGANT APPLICATION COMPLIANCE
3. PRECAUTIONS DURING VOYAGE NOTICE
4. REGISTERED FUMITOXIN FUMIGANT LABEL AND LABELLING.
5. _____
6. _____

I further confirm that the fumigator and I have discussed the structure of this vessel and it is such that there are no known means for gas to escape from cargo holds to areas occupied by the crew.

Signature of Captain or Officer in charge of vessel _____

Applicator in charge of fumigation _____

Date: _____, 19____.

Copy - Captain of Vessel Copy - Elevator Copy _____
Copy - FGIS Inspector Copy - Applicator Copy _____

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STATEMENT OF VESSEL SUITABILITY FOR FUMIGATION AND FUMIGANT APPLICATION COMPLIANCE

MANUFACTURER'S INSTRUCTIONS FOR SHIPBOARD USE OF FUMITOXIN® FUMIGANT TABLETS AND/OR PELLETS

TO: CAPTAIN OR OFFICER IN CHARGE OF _____ (Name of Vessel)

SHIPBOARD FUMIGATION OF GRAIN UNDER FGIS SHOULD FOLLOW THE FGIS FUMIGATION HANDBOOK BE SURE TO READ AND FOLLOW ALL LABEL AND LABELLING DIRECTIONS BEFORE USE

It is hereby certified that:

NOTE: SHIPBOARD FUMIGATION OF GRAIN IS REGULATED BY U.S. COAST GUARD REGULATION 46 CFR 147A

- a) I have personally inspected the visible portions of the cargo holds to be fumigated with FUMITOXIN® fumigant on the vessel _____ on _____, 19__ and find them suitable for treatment.
b) The application of the fumigant is in accordance with the EPA registered label and/or manufacturer's instructions.
c) The application of FUMITOXIN® fumigant containing 55% aluminum phosphide as the active ingredient was made to grain on this vessel on _____, 19__. Hydrogen phosphide (phosphine) gas is liberated from the tablets or pellets. The following holds were treated:

DOSAGE: 30 - 60 tablets or 165 - 300 pellets per thousand cubic feet of hold space for bulk commodities. 30 - 60 tablets or 100 - 300 pellets per thousand cubic feet of hold space for bagged commodities. Wing tanks should be included in cubic content calculations whether they will contain grain or not unless they are sealed off from the main hold.

Table with 3 columns: HOLD NUMBER, QUANTITY OF FUMIGANT USED, DIMENSION OF HOLD IN CU. FT. (with multiple blank rows for data entry)

APPLICATION: The vessel must be inspected to ascertain that the construction is such that a fumigation may be undertaken without apparent danger to the crew. Openings leading from the space to be fumigated to other areas must be sealed. Fumigant application to a hold will commence only after loading of that hold has been completed. The tablets or pellets should be applied uniformly across the grain and be probed beneath the surface. This helps to delay and reduce gas loss from the head space over the grain should high winds or leakage around the hatch covers be encountered at sea. Close the hatch covers immediately after application is completed. Post appropriate DANGER signs on hatch covers and on all other entrances to the fumigated hold.

SUGGESTED PROCEDURES AND PRECAUTIONS TO BE OBSERVED DURING VOYAGE

Do not enter fumigated cargo space. Those areas throughout the ship inhabited or entered by the crew should be monitored using appropriate gas detection equipment. Should an odor of hydrogen phosphide be detected the area must be evacuated and ventilated. Use appropriate respiratory protection equipment to locate the source of leakage.

If possible, cargo hatches should be left closed until a few hours before vessel is ready to unload.

PRECAUTIONS TO BE OBSERVED DURING DISCHARGE

Hydrogen phosphide in the air space above the grain in the holds will readily dissipate when the hatches are opened. There may be some gas remaining below the grain surface which will disappear as discharge continues.

However, should it be necessary for workers to enter the fumigated holds to unload the grain, test the air directly above the grain for the presence of hydrogen phosphide. Should gas be detected, remove workers and provide time for aeration.

Remove and discard all fumigation DANGER signs.

Signed by: _____

For: _____

One copy of the above to: Captain of the Vessel, FGIS, Elevator and Applicator, Copy _____, Copy _____

Copy - Captain of Vessel Copy - Elevator Copy - FGIS Inspector Copy - Applicator Copy

Handwritten mark resembling a stylized '11' or '7'.

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REFUSAL OF IN-TRANSIT SHIPBOARD FUMIGATION

The fumigation of the cargo of _____
 located in holds _____,
 on the vessel _____ was
 requested by the _____ elevator in _____
 as of _____ 19____. An inspection of the vessel was
 conducted and it was determined that a fumigation of the cargo could not be
 performed without exposing the ship's crew to undue safety hazards at sea. The
 fumigation of the above vessel was refused on _____ 19____.

PESTCON SYSTEMS, INC.

Fumigator in Charge _____

B. BAGS

1. General Statement:

The following instructions are intended to provide general guidelines for typical fumigations. These instructions are not intended to cover every type of situation nor are they meant to be restrictive. Other procedures may be used if they are safe, effective and consistent with the properties of aluminum phosphide products.

2. Procedure for Vertical Storage: (concrete upright bins and other silo type bins that can be quickly transferred)

- a. Bags may be added to the commodity as the bin is filled, but must be removed as the bin is emptied. FUMITOXIN tablets or pellets are most suited to this application since they can be automatically added to the commodity and are not removed after fumigation. Refer to section for tablets and pellets for directions on these uses.
- b. Locate all ventilation facilities for basement/tunnel. To the extent possible seal all openings except for fill opening.
- c. Calculate the number of bags needed and the rate which they must be added based upon the rate at which the bin will be filled.
- d. FUMITOXIN bags are applied by hand on the headhouse/gallery belt or into fill opening. Add fumigant in as continuous a manner as possible to the commodity stream.
- e. Keep an accurate count of bags added since the bags must be removed when the bin is emptied. Bags can be removed by transfer of the commodity through a screen or scale operator.
- f. Seal the bin deck openings after the application is complete.
- g. Bins requiring more than 24 hours to fill should not be fumigated by direct addition as the bin is filled. These bins should be fumigated by shallow probing or surface application.
- h. Post "Danger" placards on all entrances and on the discharge gate.
- i. Bins need not be aerated until they are transferred. Workers must not be overexposed during this transfer.

3. Procedures for Flat Storage: (Bunkers, quonset buildings, large steel tanks, rectangular shaped bins, etc.)

- a. Check the storage for tightness.
- b. To the extent practical seal any vents, cracks or sources of leaks.
- c. Determine commodity temperature, moisture and type of application to be made.
- d. Determine the dosage and exposure time based on the above information.
- e. Determine application procedure to be used. This can include shallow probing, uniform addition as the bin is filled, or surface application. Bins requiring more than 24 hours to fill should not be fumigated by addition as the bin is filled since large quantities of gaseous fumigant may escape before the bin is finally sealed.
- f. Surface application can be used if the bin can be made sufficiently gas tight to contain the fumigant long enough for it to penetrate throughout. In this instance, it is advisable to place 1/4 of the dosage in the floor level aeration ducts. This fumigant must not contact liquid phase water.

Surface application may include placing of the individual bags directly on the raw agricultural commodity or placing them on strips of Kraft paper. The latter will allow for easier retrieval of the spent bags. Better retention of gas in the commodity mass will be accomplished by digging a long narrow trench on the surface, placing the bags in the trench and covering with the commodity.

- g. Arrange enough applicators and other workers to complete the job quickly enough to avoid exposure to hydrogen phosphide gas. Monitoring with a suitable detection device is required to assure that the 0.3 ppm 8 hour TWA is not exceeded. See "Industrial Hygiene Monitoring" section found elsewhere in this manual.
- h. When possible, it is advisable to cover the commodity with plastic tarps. This will act as an additional sealing measure.
- i. Seal all remaining exits.
- j. Post "Danger" placards on and lock all entrances.

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- k. Bins need not be aerated unless re-entry is required. Consult safety procedures listed elsewhere in labeling.
Remove and dispose of bags prior to emptying bin or during emptying if the bags cannot be retrieved otherwise.

4. Procedures for Bunker and Other Outdoor Tarped Commodities:

- a. Follow steps b, c, d and e in Section 3 above.
- b. When tarps are spread over ground storage, be sure they are sealed together. Sand snakes or dirt can be used for ground seal.
- c. Surface or shallow probing may be done through slits in the tarp or the tarp can be spread over the commodity after application. Be sure slits are sealed after application.
- d. This is an outdoor application so safety monitoring and respiratory equipment are not required.
- e. Post "Danger" placards.
- f. When possible, remove bags prior to moving the commodity.

5. Procedure for Farm Storage:

a. General:

Since on farm storage is almost always flat storage, refer to "Procedures for Flat Storage" found elsewhere in this manual. The instructions which follows provide additional guidance.

b. Sealing:

Leakage is the single most important cause of failure in the treatment of farm bins. Since these bins are usually small by comparison, they have a higher leakage area in proportion to their capacity. Most wooden granaries are so porous that they cannot be successfully fumigated unless they are completely covered with plastic sheeting or similar tarp. Steel bins are also usually of very loose construction and therefore require much attention to sealing. All vents and aeration ducts must be tightly sealed using 4 mil polyethylene sheeting or its equivalent. The plastic must be sealed directly to the metal with tape or other adhesive. It is not sufficient to "cinch up" the plastic as with a belt. The surface of the grain should be covered with plastic sheeting after FUMITOXIN[®] bags have been applied. Tarping of the grain surface will greatly reduce leakage. Other sealing techniques are recommended, i.e., closure of all large cracks with caulking, foam insulation or other sealant. Sealing these cracks will greatly reduce the required dosage. 2 mil or thicker plastic can be used for tarping the grain surface, however, the plastic used on the outside of the bin should be at least 4 mils. When an entire structure is tarped, the plastic must be at least 6 mils thick to prevent excessive tearing during the fumigation.

c. Dosage:

Unless all the large cracks are sealed as described above, the dosage recommended should be 8-16 bags per 1000 bu. (6-13 bags per 1000 cu. ft.) capacity of the space under the plastic tarp.

d. Additional Applications Instructions:

Probing bags into the grain mass is the recommended method of application. Probe insertions should be scattered evenly over the surface. Place no more than 1/4 of the total dose in floor level aeration ducts. Be sure the inside of the aeration duct is dry before adding the bags. Addition of bags to water in an aeration duct can cause a fire. Seal the aeration fan as described above.

- e. Place "Danger" placards on entrances to the bin and near the ladder. Refer to placarding instructions found elsewhere in this manual.

NOTE. If monitoring equipment is not available on a farm and application cannot be done from outside of a structure, an approved respirator must be worn during application from within an enclosed indoor area.

6. Procedures for Mills, Warehouses, Food Processing Plants, Chambers, Trucks, Trailers, Containers and Other Static Sealable Enclosures:

- a. Determine the dosage of bags to be applied based upon the following parameters for space fumigation:

The volume of the structure

The air and/or commodity temperature

The general tightness of the structure to be fumigated

- b. Determine exposure period based on the "Exposure Guide" found elsewhere in this document.
- c. Seal all openings except for the door being used to enter and leave.
- d. Place bags on floor in a systematic manner, beginning at the point furthest from the exit door. Do not toss bags into inaccessible areas. Do not pile bags. Spread bags so they are not touching.
- e. FUMITOXIN bags are not to be placed in or attached to commodity packages containing processed food. If bags cannot be placed on the floor, attach to walls or other support. Bags may be taped to a cardboard disc and disc attached to commodity packaging.
- f. When fumigating multiple story buildings, each floor is considered a separate enclosure. Application should begin with the top floor and end with the ground floor.
- g. Doors leading to the fumigated space are then closed, sealed and locked. "Danger" placards must be placed on all entrances. Refer to placarding instructions found elsewhere in this manual.
- h. Upon completion of the exposure period, windows and doors should be opened and the fumigated structure allowed to aerate. Gas concentration readings must be taken using low level detector tubes before allowing personnel to re-enter the area. Refer to aeration, re-entry and Industrial Hygiene Monitoring sections found elsewhere in this document.
- i. Dispose of remaining bags according to DISPOSAL instructions found elsewhere in this manual.

7. Procedures for Space Fumigations Under Tarps:

a. General:

Follow the pertinent instructions given immediately above part in "6."

b. Sealing:

An enclosure suitable for fumigation may be formed by covering packaged commodities with plastic sheeting. The sheets may be taped, glued, or clamped together to provide a sufficient width of material to ensure that adequate sealing is obtained.

The plastic covering may be sealed to the floor using tape, glue, sand snakes or by placing soil or sand onto the ends of plastic covering or by other suitable procedures that ensures a good seal.

c. Additional Application Instructions:

Bags may be applied under the edge of the tarp or through slits. The bags should be protected from condensation or other source of water. The slits in the covering should be sealed after application of bags. Bags should not be piled or overlapped. Care should be taken to prevent the plastic tarp from covering the bags.

d. Additional Precautions:

Indoor fumigation precautions are handled as any other situation where the application is made from outside the area being fumigated. Workers may occupy adjacent indoor areas but they must be protected from overexposure to hydrogen phosphide by adequate sealing, ventilation or respiratory protection.

Do not walk on stacks during the fumigation.

Place "Danger" placards at conspicuous points on the enclosure.

e. Aeration:

Precautions must be taken to assure that exposure to hydrogen phosphide in excess of 0.3 ppm does not occur during the fumigation and/or aeration.

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8. Application Procedure for Rail Cars, Containers, Trucks, and Other Similar Vehicles:

a. General:

The following directions are for transport vehicles both static or in-transit. Trucks, vans, chambers, containers and other transport vehicles to be placed aboard vessels or on piggyback rail shipments may be fumigated in-transit, but must not be moved over public roads or highways when moved to the rail site or vessel for loading.

Railcars, containers, trucks, and other transport vehicles loaded with bulk commodities to which FUMITOXIN® bags may be added are treated in the same way as any other storage facility. FUMITOXIN may be added as the vehicle is being filled, the bags may be scattered over the surface after loading is complete or probed beneath the surface.

Surface application is not recommended for in-transit fumigation. Be sure all vents, cracks or other openings are sealed.

b. Procedures for Processed Foods:

FUMITOXIN® bags must not come into contact with processed foods. Bags must be applied in such a way as to prevent contact with the commodity or its packaging

c. Bulk Rail Cars:

1. Close and secure all hatch covers except those being utilized for the fumigation.
2. Seal all other openings. Pay particular attention to vents.
3. Clean the flange lip of hatch (or hatches) being utilized. If the commodity extends into the throat of the hatch, force it away as far as possible.
4. Open cans and tape bags to a cardboard disc. Be sure to only tape across the bag ends only
5. Place the disc into position, bag side up, and secure with masking tape.
6. Lower the cover into place and secure. Tape "Danger" placard securely to the hatch cover

d. Procedures for Boxcars.

1. Close and secure one of the doors from the inside. Seal all openings and joints. If possible, caulk joints and drape entire doorway with polyethylene film, securing the edges to the inner wall, floor and ceiling with masking tape.
2. Inspect the roof, floor and walls for holes and/or cracks. Seal all openings
3. If possible, drape remaining doorway with polyethylene film before door is closed. Secure edges to door jams and floor. Close door and secure. If doorway is draped with polyethylene, it may not be necessary to seal the door from the outside. If door is not draped, seal all cracks, openings and joints from the outside.
4. Open cans and tape bags to cardboard discs. Be sure to tape across the bag ends only
5. Place the loaded discs inside the boxcar and secure, bag side up, with tape or nail to the wall.
6. Post "Danger" placards on each door.

e. Procedures for Containers:

1. Procedures for trucks, vans and other transport containers are essentially the same as boxcars, except their doors tend to be more gas tight, and they often have only a rear door, which must be sealed after application is completed.

9. Application Procedures for In-Transit Fumigation of Shipholds:

a. General Information:

1. Shipboard fumigation is also regulated by the U.S. Coast Guard Regulations 46 CFR 147A
2. This product is toxic to fish. Keep out of lakes, streams and other aquatic environments. Do not contaminate water by cleaning equipment or disposal of wastes

b. Pre-voyage Fumigation Procedures and Precautions:

1. Prior to fumigating a vessel for in-transit cargo fumigation, the master of the vessel or his representative, and the fumigator must determine whether the vessel is suitably designed and configured so as to allow for safe occupancy by the ship's crew throughout the duration of the fumigation.

If it is determined that the design and configuration of the vessel does not allow for safe occupancy by the ship's crew throughout the duration of the fumigation, then the vessel will not be fumigated unless all crew members are removed from the vessel. The crew members will not be allowed to occupy the vessel until the vessel has been properly aerated and a determination has been made by the master of the vessel and the fumigator that the vessel is safe for occupancy.

2. The person responsible for the fumigation must notify the master of the vessel, or his representative, of the requirements relating to personal protection equipment, detection equipment and that a person qualified in the use of this equipment must accompany the vessel with cargo under fumigation. Emergency procedures, cargo ventilation, periodic monitoring and inspections, and first aid measures must be discussed with and understood by the master of the vessel or his representative.
3. Seal all openings to the cargo hold or tank using suitable water proof, gas tight materials. Lock and/or otherwise secure all openings, manways, etc., used to enter the hold. Post appropriate "Danger" placards on same.
4. On tankers the over-space pressure relief system of each tank must be sealed by (1) the closing of appropriate valves and (2) sealing the openings into over-space with gas tight materials.
5. Contact appropriate authorities.
6. If the fumigation is not completed and the vessel aerated before the manned vessel leaves port, the person in charge of the vessel shall ensure that at least two units of personal protection equipment and one gas or vapor detection device and a person qualified in their operation be on board the vessel during voyage.
7. During the fumigation or until a manned vessel leaves port or the cargo is aerated, the person in charge of the fumigation shall ensure that a qualified person using gas or vapor detection equipment tests areas adjacent to spaces containing fumigated cargo and all regularly occupied areas for fumigation leakage. If leakage of the fumigant is detected, the person in charge of the fumigation shall take action to correct the leakage, or shall inform the master of the vessel, or his representative, of the leakage so that corrective action can be taken. Personal protection equipment means a gas mask fitted with a canister designed for phosphine gas which is approved by NIOSH/MSHA. A gas mask and canister is approved for use up to 15 ppm. Above 15 ppm or at unknown concentrations a SCBA or its equivalent must be used

c. Procedures for Bulk Dry Cargo Vessels and Tankers:

1. Calculate dosage on the basis of cargo hold volume. Dosage is always calculated for the total hold volume irrespective of the commodity tonnage in the hold.
FUMITOXIN® bags 2 to 6 bags per 1,000 cu. ft.
2. After a hold has been filled or completed, open containers and distribute bags uniformly onto commodity surface with spacing between each. Do not place bags within 10 feet of side walls. Step on each after placement or probe bags into commodity.
3. Observe closing of hatch covers closely. Stop the closing if the cover snags an individual bag. Reposition the bag and resume closing.

d. Voyage Precautions and Procedures:

1. At regular intervals, monitor spaces adjacent to areas containing fumigated cargo and all regularly occupied areas, for fumigant leakage using appropriate gas detection equipment.

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Special attention should be given to living quarters, kitchens, storerooms, mess halls, keel ducts, day rooms, the bridge, engine room and any other enclosed spaces occupied or frequented by crew members during voyage.

- 2. If hydrogen phosphide (phosphine) is detected, evacuate the space or area, and seal off the source of the leak wearing appropriate respiratory protection equipment. Ventilate the area before allowing occupants to return.
- 3. Do not enter fumigated holds or tanks.
- 4. Do not open, ventilate or aerate the fumigated holds during the voyage unless the fumigation must be aborted.

e. Precautions and Procedures During Discharge:
 If necessary to enter holds prior to discharge, test spaces directly above cargo surface for fumigant concentration, using appropriate gas detection and personal protection equipment. Do not allow entry to fumigated areas without personal protection equipment, unless fumigant concentrations are at safe levels, as indicated by a suitable detector.

f. Personal Protective Equipment and Monitoring:

- 1. Fully loaded holds on dry bulk carriers are considered an outdoor fumigation.
- 2. Tanker holds which must be entered to fumigate and partially loaded holds on dry bulk carriers are fumigated from within the area being treated.
- 3. See sections on "Respiratory Protection" and "Applicator and Worker Exposure" found elsewhere in this manual for requirements.
- 4. If hydrogen phosphide (phosphine) is detected a minimum of two qualified persons should wear the gas mask and canister described above while aerating the area and locating and sealing the leak.

10. Application Procedures for In-Transit Fumigation of Containers on Ships:

- a. When fumigating bulk commodities to which direct addition to this fumigant is not allowed or contact to its packaging, please refer to section covering directions for static containers.
- b. In-transit fumigation of containers on ships is regulated by Coast Guard Regulation 46 CFR 147A and the applicator or shipper must obtain and comply with U.S. Coast Guard Special Permit No. 52-75. Contact the Coast Guard or Pestcon Systems, Inc. for additional information.
- c. Comply with general precautions given in labeling.

11. Applications Procedures for Fumigations of Barges:

a. General:
 Since barge fumigation is a type of flat storage fumigation as well as having similarities in common with a ship, refer to sections on "Procedures for Flat Storage" and "Application Procedures for In-transit Fumigation of Ship's Holds" found elsewhere in this manual. Barge fumigation is regulated by the U.S. Coast Guard Regulation 46 CFR 147A as modified by U.S. Coast Guard Special Permit No. 2-75. The shipper or fumigator must possess this permit prior to fumigating. To obtain this permit contact:

U.S. Coast Guard
 Hazardous Materials Branch
 Washington, D.C. 20593-0001

b. Sealing:
 Special care must be taken in determining whether a barge is suitable for fumigation. Excessive leakage may occur through poorly sealed hold covers. Prior to unloading barges, make appropriate tests to ascertain cargo area, as well as ballast areas, are free of hydrogen phosphide gas.

XVI. PLACARDING OF FUMIGATED AREAS

The applicator must placard or post all entrances to the fumigated areas with signs bearing:

- 1. The signal word DANGER/PELIGRO and the SKULL AND CROSSBONES symbol in red.
- 2. The statement, "Area and/or commodity under fumigation, DO NOT ENTER/NO ENTRE."
- 3. The statement, "This sign may only be removed after the commodity and/or area is completely aerated (contains 0.3 ppm or less phosphine gas). If incompletely aerated commodity is transferred to a new site, the new site must also be placarded, and workers must not be exposed to more than 0.3 ppm phosphine."
- 4. The date and time fumigation begins and is completed.
- 5. Name of fumigant used.
- 6. Name, address, and telephone number of the applicator.

All entrances to a fumigated area must be placarded. Where possible, placards should be placed in advance of the fumigation in order to keep unauthorized persons away. For railroad hopper cars, placarding must be placed securely on both sides of the car near the ladders and next to the top hatch which the fumigant is introduced. Do not remove a placard until the treated commodity is aerated down to 0.3 ppm or less. To determine whether aeration is complete, each fumigated site or vehicle must be monitored following directions found under Industrial Hygiene Monitoring and shown to contain 0.3 ppm or less phosphine gas in the air space around and, when feasible, in the mass of the commodity. Transfer of incompletely aerated commodity to a new site is permissible, however, the new storage site must be placarded if more than 0.3 ppm is detected. Workers who handle incompletely aerated commodity must be informed and appropriate measures taken (i.e. ventilation or respiratory protection) to prevent exposures from exceeding the TLV's for hydrogen phosphide.

It is recommended that the person responsible for removing placards be familiar with the physical, chemical and toxicological properties of hydrogen phosphide. They should also be knowledgeable in how to take gas readings, exposure limits, symptoms and first aid treatment for hydrogen phosphide poisoning.

XVIII. AERATION OF FUMIGATED COMMODITIES

- a. Foods and Feeds**
 Tolerances for hydrogen phosphide residues have been established at 0.1 ppm for animal feeds and 0.01 ppm for finished foods. To guarantee compliance with these tolerances, it is necessary to aerate these commodities for 48 hours prior to offering them to the end consumer.
- b. Tobacco**
 Tobacco must be aerated for at least three days (72 hours) when fumigated in hogsheads or until concentration is below 0.3 ppm and for at least two days (48 hours) when fumigated in other containers. When plastic liners are used, longer aeration periods will probably be required to aerate the commodity down to 0.3 ppm. As an alternative to these aeration periods, each container of a treated commodity may be analyzed for residue using accepted analytical methods. If residues are less than tolerance levels, the commodity may be shipped to the consumer regardless of the above holding periods.

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XVIII. DISPOSAL INSTRUCTIONS

A. TABLETS AND PELLETS

a. GENERAL

The EPA has determined that proper disposal of aluminum phosphide will cause no unreasonable adverse effects to the environment. Contact your State Pesticide or Environmental Control Agency, or Hazardous Waste representative at the nearest EPA Regional Office for guidance.

1. Do not contaminate water, food or feed by disposal of pesticide wastes.
2. Unreacted or partially reacted FUMITOXIN® is acutely hazardous. Improper disposal of excess pesticide, spray mixture or rinsate is a violation of Federal Law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency or the Hazardous Waste representative at the nearest EPA Regional Office for guidance. For specific instructions, refer to wet deactivation method of disposal and spill and leak procedures, or call your Pestcon Systems, Inc. representative for guidance.
3. Some local and state waste disposal regulations may vary from the following recommendations. Disposal procedures should be reviewed with appropriate authorities to insure compliance with local regulations. Contact your State Pesticide or Environmental Control Agency or Hazardous Waste Specialist at the nearest EPA Regional Office for guidance.
4. If properly exposed, the residual dust remaining after a fumigation with FUMITOXIN will be a grayish-white powder and contain a small amount of unreacted aluminum phosphide. THE RESIDUAL DUST FROM INCOMPLETELY EXPOSED FUMITOXIN WILL REQUIRE SPECIAL CARE.

b. DIRECTIONS FOR DISPOSAL OF SPENT RESIDUAL DUST

1. In open areas, small (not more than 5 flasks) amounts of residual dust may be disposed of on site by burial or by spreading over the land surface away from inhabited buildings.
2. Residual dust from FUMITOXIN may also be collected and disposed of at a sanitary landfill, incinerator or other approved sites or by other procedures approved by Federal, State or local authorities.
3. From 2 to 3 kg (4 to 7 lbs.) of residual dust from 2 to 3 flasks of FUMITOXIN may be collected for disposal in a 1-gallon bucket. Larger amounts, up to one-half case, may be collected in burlap, cotton or other types of porous cloth bags for transportation in an open vehicle to the disposal site. Do not collect dust from more than 7 flasks of tablets or 10 flasks of pellets (about 11 kg or 25 lbs.) in a single bag. DO NOT PILE BAGS TOGETHER. DO NOT USE THIS METHOD FOR PARTIALLY SPENT OR "GREEN" DUST. CAUTION: DO NOT COLLECT DUST IN LARGE DRUMS, DUMPSTERS, PLASTIC BAGS OR OTHER CONTAINERS WHERE CONFINEMENT MAY OCCUR.

c. DIRECTIONS FOR DEACTIVATION AND DISPOSAL OF "GREEN" PARTIALLY SPENT RESIDUAL DUST.

Confinement of partially spent residual dust, as in a closed container, or collection and storage of large quantities of dust may result in a fire hazard. Small amounts of hydrogen phosphide may be given off from traces of unreacted aluminum phosphide, and confinement of the gas may result in a flash.

Prior to disposal, it is necessary to further deactivate partially spent residue following an incomplete exposure time or following a fumigation which has produced large quantities of partially spent material. You must use either the wet or dry method described below

d. DIRECTIONS FOR WET METHOD DEACTIVATION AND DISPOSAL OF LARGE QUANTITIES (OVER 5 FLASKS) OF PARTIALLY SPENT OR "GREEN" DUST

1. Deactivating solution is prepared by adding the appropriate amount of low sudsing liquid detergent or surfactant to water in a drum or other suitable container. A 2% solution of detergent (4 cups to 30 gallons) is suggested. The container should be filled with deactivating solution to within a few inches of the top.

2. Residual dust is poured slowly into the deactivating solution and stirred so as to thoroughly wet all of the residual dust. This must be done in the outdoor air and not the fumigated structure. Dust from FUMITOXIN® tablets or pellets should be mixed in no less than ten gallons of water-detergent solution for each case of material used.
3. Dispose of the deactivated residue-water suspension, with or without preliminary decanting, at a sanitary landfill or other suitable site approved by local authorities. Where permissible, the slurry may be poured into a storm sewer (if you have allowed this mixture to stand for no less than 36 hours), or out onto the ground.
4. CAUTION: Wear appropriate respiratory protection during wet deactivation of partially spent material. Do not cover the container holding the slurry at any time. Do not dispose of residual dust in a toilet. Do not allow quantities of dry, residual dust from FUMITOXIN to be collected or stored.
5. DIRECTIONS FOR DRY METHOD DEACTIVATION AND DISPOSAL OF SMALL (NOT MORE THAN 5 FLASKS) OF PARTIALLY SPENT DUST.
 1. Smaller amounts, not more than 5 flasks, of partially spent dust may be spread in an open area away from inhabited buildings and restricted from access to humans or animals and allowed to be further deactivated by atmospheric exposure.
 2. This dust may then be buried or transported to appropriate sites and disposed of as directed in "Directions for Disposal of Spent Dust."

f. DISPOSAL OF EMPTY FLASKS AND PLASTIC STOPPERS

1. In open air triple rinse open empty flasks and stoppers with water, then offer for recycling or reconditioning.
2. Or puncture open empty triple rinsed flask and dispose of in a sanitary landfill, or by other procedure approved by state and local authorities.
3. Rinsate may be disposed of in a sanitary landfill or by other approved procedures.
4. Or, expose open empty flask and stopper to atmospheric conditions until any remaining residue in the flask has reacted.
5. Then puncture and dispose of open empty aerated flask in a sanitary landfill or other site approved by State and local authorities.

B. BAGS

a. Disposal of UNREACTED or PARTIALLY REACTED FUMITOXIN bags: (From spills, leaking cans or other sources).

Unreacted or partially reacted FUMITOXIN bags are acutely hazardous. Improper disposal of this product is a violation of federal law. If this product cannot be disposed of by ordinary use or according to the instructions that follow, contact your state pesticide or environmental control agency or the hazardous waste representative at the nearest EPA regional office for guidance. Do not contaminate water by disposal.

Some local and state waste disposal regulations may vary from the following recommendations. Disposal procedures should be reviewed with appropriate authorities to ensure compliance with local regulations.

FOR SPECIFIC INSTRUCTIONS, SEE "SPILL AND LEAK PROCEDURES" FOUND ELSEWHERE IN THIS MANUAL.

b. Disposal of FUMITOXIN Bags Following a Space Fumigation:

1. General:

If properly exposed, the bags remaining after a fumigation will contain a grayish white spent, nonhazardous waste and will contain only a small amount of unreacted aluminum phosphide. However, residual dust from incompletely exposed bags (See "EXPOSURE GUIDE" found elsewhere in this manual) will require special care. Confinement of partially spent bags, as in a closed container may result in a fire hazard. Small amounts of hydrogen phosphide may be given off from the unreacted aluminum phosphide, and confinement of the gas may result in a flash. Unless it can be determined with certainty that the bags are spent, they must be deactivated as described below prior to disposal.

2. Deactivation of FUMITOXIN Bags:

The methods below may be used for deactivating used or unused FUMITOXIN bags regardless of the extent to which the aluminum phosphide has decomposed.

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a. **Dry Deactivation:**

Collect bags and place them into a well ventilated holding container such as wire cage used for other hydrogen phosphide fumigants or other similar devices. Store the bags in one of these devices until the bags are spent. Unused or partially spent bags can be spread out on the ground in a secure open area away from occupied buildings to be deactivated by atmospheric moisture. Care should be taken so that they are not carried away by the wind. Dry deactivation is the recommended procedure for unused or partially spent bags. If in doubt, as to whether the bags are spent, contact Pestcon Systems, Inc.

Ignition may occur if large numbers of incompletely reacted bags are contacted by liquid water. This can occur in open or perforated storage containers. Therefore, such storage should be out of doors in a relative isolated area protected from rain.

b. **Wet Deactivation — Method One:**

Fill an appropriate sized container with water a few inches from the top. Submerge bags for 36 hours. A metal grid works well to keep bags submerged. Do not cover container. Wear appropriate respiratory protection. This should be done outdoors. The water may be disposed of in a storm sewer or by pouring it out on the ground.

c. **Wet Deactivation — Method Two:**

Fill an appropriate sized metal container 2/3 full with water. For each gallon of water add 1/4 cup of low sudsing detergent or surfactant. Use no less than 1 gallon of water/detergent solution for 60 FUMITOXIN bags. Open each bag and dump contents into the container as the water is stirred. Wear appropriate respiratory protection. **DO NOT COVER THE CONTAINER AT ANY TIME.** This should be done outdoors.

c. **Disposal Procedures:**

In open areas, small amounts (up to 7.0 kg) of the spent bags may be disposed of on site by burial of the bags or by opening the bags and spreading the dust over the land surface away from inhabited buildings.

Spent bags may also be collected and disposed of at a sanitary landfill, approved pesticide incinerator or other approved sites or by other procedures approved by federal, state and local authorities.

Do not dispose of dust in a toilet.

Dispose of water/dust mixture (slurry) (with or without preliminary pouring out of excess water) in a sanitary landfill or other suitable burial site approved by local authorities. Where permissible, the slurry may be poured out on the ground. If it is held 36 hours it may be poured into a storm sewer.

Never confine partially spent bags or slurry in closed containers such as closed drums or plastic bags.

d. **Disposal of Cans:**

Dispose of cans in a sanitary landfill or by other approved state or local procedures.

- a. Return all intact aluminum flasks to cardboard cases or other suitable packaging which has been properly marked according to DOT regulations. Notify consignee and shipper of damaged cases.
- b. If aluminum flasks have been punctured or damaged so as to leak, the container may be temporarily repaired with aluminum tape or the FUMITOXIN® may be transferred from the damaged flasks to a sound metal container which should be sealed and properly labeled as aluminum phosphide. Transport the damaged containers to an area suitable for pesticide storage for inspection. Contact Pestcon Systems, Inc. for further instructions.
- c. If a spill has occurred which is only a few minutes old, collect the tablets and pellets and place them back into the original flasks, if they are intact, and stopper tightly. Place the tablets and pellets in a sound metal container if the original flasks are damaged. **CAUTION:** These flasks may flash upon opening at a later date.
- d. If the age of the spill is unknown or if the tablets or pellets have been contaminated with soil, debris, water, etc., gather up the spillage and place it into small open buckets having a capacity no larger than about 1 gallon. Do not add more than one flask of spillage material, 1 to 1.5 kg (2 to 3 lbs.) to the bucket. If on-site, wet deactivation is not feasible, these open containers should be transported in open vehicles to a suitable area. Wet deactivation may be carried out as described away from inhabited buildings. Alternatively, small amount of spillage from 4 to 5 flasks (4 to 8 kg, 9 to 18 lbs.) may be spread out in an open area to be deactivated by atmospheric moisture.

2. **PROCEDURE FOR WET DEACTIVATION OF SPILLS**

- a. Deactivating solution is prepared by adding the appropriate amount of low sudsing liquid detergent or surfactant to water in a drum or other suitable container. A 2% solution or 4 cups in 30 gallons is recommended. The container should be filled with deactivating solution to within a few inches of the top.
- b. The tablets or pellets are poured slowly into the deactivating solution and stirred so as to thoroughly wet all of the FUMITOXIN. This must be done in the open air. FUMITOXIN tablets or pellets should be mixed into no less than about 15 gallons of water-detergent solution for each case of spilled material.
- c. Allow the mixture to stand, with occasional stirring, for at least 36 hours.
- d. Dispose of the slurry of deactivated material, with or without preliminary decanting, at a sanitary landfill or other suitable site approved by local authorities. Where permissible, this slurry may be poured out on to the ground or into a storm sewer.

CAUTION: Wear appropriate respiratory protection during wet deactivation of unexposed FUMITOXIN®. Never place pellets, tablets, or dust in a closed container such as a dumpster, sealed drum, plastic bag, etc., as flammable concentration can develop and a flash of hydrogen phosphide gas is likely to occur. THE EPA HAS DETERMINED THAT PROPER DISPOSAL OF ALUMINUM PHOSPHIDE WILL CAUSE NO UNREASONABLE ADVERSE EFFECTS TO THE ENVIRONMENT.

XIX. **SPILL AND LEAK PROCEDURE**

A. **TABLETS AND PELLETS**

1. **HANDLING SPILL**

A spill, other than accidental to application or normal handling may produce high levels of gas and, therefore, attending personnel must wear SCBA when the concentration of hydrogen phosphide gas is unknown. Other NIOSH/MSHA approved respiratory protection may be worn if the concentration is known. Do not use water at any time to clean up a spill of FUMITOXIN®. Water in contact with unreacted tablets or pellets will greatly accelerate the production of hydrogen phosphide gas which could result in a toxic and/or fire hazard. Wear dry gloves of cotton or other suitable material when handling aluminum phosphide.

FOR ASSISTANCE CONTACT:

PESTCON SYSTEMS, INC.
5511 CAPITAL CENTER DRIVE, SUITE 302
RALEIGH, NC 27606, USA
TELEPHONE: (919) 859-2500
FAX: (919) 859-2155
or
CHEMTREC (800) 424-9300

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B. BAGS

1. General Handling:

A spill other than incidental to application or normal handling or punctured containers, can produce high levels of gas and, therefore attending personnel must wear a SCBA or its equivalent when concentration of hydrogen phosphide gas is unknown. If the concentration is known, other NIOSH/MSHA approved respiratory protection can be worn. Wear dry gloves of cotton or other suitable material when contact with the powdered formulation is likely.

2. Damage to Fiberboard Case:

Check cans. If they are damaged, handle as described below. If they are undamaged, return them to cardboard cartons or other suitable packaging which complies with DOT regulations.

3. Leaking Can Procedures:

If cans have been punctured or damaged causing a leak, the product may be immediately used or the container may be temporarily repaired with aluminum tape. The FUMITOXIN® bags may be transferred from the damaged can to a sound metal container which should be sealed and properly labeled as aluminum phosphide, or it may be deactivated and disposed of. Refer to deactivation and disposal method found in this manual. Transport the damaged containers to an area suitable for pesticide storage for inspection. Further instructions and recommendations may be obtained, if required, from Pestcon Systems, Inc. Handle empty damaged containers as described under "Disposal of Empty Cans."

4. Spill Procedures:

Since the formulation is placed in small, tough paper bags, spill will be either bags or a small quantity of powder spilled from a punctured bag. Consequently, spills are not likely to constitute a frequent problem.

Do not flush spillage down drain with water. DO NOT use water at anytime to clean a spill. Water in contact with unreacted FUMITOXIN bags will rapidly accelerate the production of hydrogen phosphide gas and could cause spontaneous ignition of the gas. If bags have just been spilled and have not been contaminated by other materials, collect the bags and use them or place them into a sound metal container and seal it or deactivate and dispose of them. If possible use immediately. CAUTION: AN IGNITION MAY OCCUR WHEN THESE CONTAINERS ARE OPENED. If the spill is more than a few minutes old or has been contaminated with water, gather it up and place it into an open top can and deactivate it immediately. If on-site deactivation is not feasible, these open containers should be transported in open vehicles to a suitable area away from occupied building. Wet or dry deactivation may then be carried out. See deactivation instructions found elsewhere in this manual.

FOR ASSISTANCE CONTACT:

PESTCON SYSTEMS, INC.

5511 CAPITAL CENTER DRIVE, STE. 302
RALEIGH, NC 27606, USA

TELEPHONE (919) 859-2500
FAX: (919) 859-2155

OR

CHEMTREC (800) 424-9300

XX. LOCAL EMERGENCY PHONE NUMBERS

LOCAL EMERGENCY PHONE NUMBERS:

NAME OF PERSON IN CHARGE OF SITE:

ADDRESS:

TELEPHONE NO.:

FUMIGATION DATE:

START:

OPEN:

AERATION COMPLETE:

REVIEWED LABEL WITH:

NAME: _____ **SIGNATURE:** _____

NAME: _____ **SIGNATURE:** _____

NAME: _____ **SIGNATURE:** _____

NAME: _____ **SIGNATURE:** _____

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XXI. NOTE TO PHYSICIAN

WE RECOMMEND THAT YOU GIVE YOUR COMPANY PHYSICIAN AND/OR THE EMERGENCY CENTER CLOSEST TO THE JOB SITE A COPY OF THIS PAGE:

Note to Physician:

Aluminum phosphide in tablets, pellets and bags react with moisture from the air, water, acids and many other liquids to release hydrogen phosphide (phosphine) gas. Mild exposure to inhalation causes malaise (indefinite feeling of sickness), ringing of ears, fatigue, nausea, and pressure in the chest which is relieved by removal to fresh air. Moderate poisoning causes weakness, vomiting, pain just above the stomach, chest pain, diarrhea and dyspnea (difficulty in breathing). Symptoms of severe poisoning may occur within a few hours to several days, resulting in pulmonary edema (fluid in lungs) and may lead to dizziness, cyanosis (blue or purple skin color), unconsciousness, and death.

In sufficient quantity, phosphine affects the liver, kidneys, lungs, nervous system, and circulatory system. Inhalation can cause lung edema (fluid in lungs) and hyperemia (fluid in brain). Ingestion can cause lung and brain symptoms but damage to the viscera (body cavity organs) is more common. Phosphine poisoning may result in (1) pulmonary edema, (2) liver elevated serum GOT, LDH and alkaline phosphatase, reduced prothrombin, hemorrhage and jaundice (yellow skin color) and (3) kidney hematuria (blood in urine) and anuria (abnormal lack of urination). Pathology is characterized of hypoxia (oxygen deficiency in body tissue). Frequent exposure to subacute concentrations over a period of days or weeks may cause poisoning. Treatment is symptomatic.

The following measures are suggested for use by the physicians in accordance with their own judgment

In its milder forms, symptoms of poisoning may take some time (up to 24 hours) to make their appearance, and the following is suggested:

1. Give complete rest for 1-2 days, during which the patient must be kept quiet and warm.

2. Should the patient suffer from vomiting or increased blood sugar, appropriate solutions should be administered. Treatment with oxygen breathing equipment is recommended as is the administration of cardiac and circulatory stimulants.

In case of severe poisoning (intensive care unit recommended):

1. Where pulmonary edema is observed, steroid therapy should be considered and close medical supervision is recommended. Blood transfusions may be necessary

2. In case of manifest pulmonary edema, venesection should be performed under vein pressure control. Heart Glycosides (I.V.) (in case of hemoconcentration, venesection may result in shock). On progressive edema of lungs, immediate intubation with a constant removal of edema fluid and oxygen over-pressure respiration, as well as any measures required for shock treatment. In case of kidney failure, extra-corporeal hemodialysis is necessary. There is no specific antidote known for this poisoning.

3. Mention should be made here of suicidal attempts by taking solid phosphine by the mouth. After swallowing, emptying of the stomach by vomiting, flushing of the stomach with diluted potassium permanganate solution or a solution of magnesium peroxide until flushing liquid ceases to smell of carbide. Thereafter, apply carbomedicinals.

PESTCON SYSTEMS, INC.
 5511 CAPITAL CENTER DRIVE, STE. 302, RALEIGH, NC 27606
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XXII. SAMPLE INDUSTRIAL HYGIENE MONITORING LOG

1. SITE LOCATION: _____

2. DATE/TIME FUMIGATION STARTED: _____

3. WEATHER CONDITION(S): _____

DATE	TIME	LOCATION	P.P.M.	INITIALS

4. FUMIGATION COMPLETED: DATE/TIME: _____

5. AERATION COMPLETED: DATE/TIME: _____

6. SIGNED: _____

Handwritten initials/signature

- Requirements
- Proper Use
- 4. Detection Equipment
 - Requirements
 - Proper Use
- 5. Applicator/Worker Exposure
 - Limits
 - Monitoring
- 6. Placarding
- 7. Aeration
- 8. Disposal of Residues
- 9. FUMIGATION TRAINING (including but not limited to the following items)
 - Farm Storage
 - Vertical Storage
 - Flat Storage
 - Trucks, Vans, etc.
 - Small Enclosures
 - Mills, Warehouses, etc.
 - Barge
 - Railcar
 - Beehives, Supers, etc.
 - Fumi-Sleeve dust retainer
 - Rodent Burrow
 - Shiphold

Date: _____ Time: _____

Meeting Name: _____

Instructor: _____

Name: _____

Address: _____

Phone: _____

Comments: _____

Signature _____

JT

Reg # 5857-6

PM-32

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**RESTRICTED USE PESTICIDE
DUE TO ACUTE INHALATION TOXICITY OF HIGHLY
TOXIC HYDROGEN PHOSPHIDE (PHOSPHINE, PH₃ GAS)**

For retail sale to and use only by Certified Applicators for those uses covered by the applicators certification or persons trained in accordance with the attached product manual working under the direct supervision and in the physical presence of the Certified Applicator. Physical presence means onsite or on the premises. Refer to Pestcon Systems, Inc. Applicator's Manual for complete instructions for the safe use of this product.

Fumitoxin

**EPA REG. NO. 5857-1 — TABLETS
EPA REG. NO. 5857-2 — PELLETS
EPA REG. NO. 5857-6 — BAGS**

**FOR USE AGAINST LISTED INSECTS WHICH INFEST STORED
COMMODITIES, SPECIFIED PROCESSED FOODS, & ANIMAL FEEDS**

**ACTIVE INGREDIENT — Aluminum Phosphide 55%
Inert Ingredients 45%
100%**



**KEEP OUT OF REACH OF CHILDREN
DANGER / PELIGRO — POISON**



**PESTCON
SYSTEMS, INC.
U.S.A.**

ACCEPTED
23 AUG 1984
Under the Federal
Rodenticide Act, as amended, for the
pesticide registered under
EPA Reg. No. 5857-6

23 AUG 1984
CAPITAL CENTER DRIVE, STE. 302
RALEIGH, NC 27606, USA
TELEPHONE: (919) 859-2500
FAX: (919) 859-2155
EPA EST. NO. 46060-CI-04

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ACCEPTED
23 AUG 1984
Under the Federal
Rodenticide Act, as amended, for the
pesticide registered under
EPA Reg. No. 5857-6

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I. INTRODUCTION

A. History:

Pestcon Systems, Inc. was the first to create and implement a "SAFE PRACTICES POLICY" for agricultural fumigants. We've been involved in the field of insect control for over half a century. This applicators manual provides information and gives detailed instructions on how to apply this product safely. Before using, read and follow all precautions and directions on the label and in labeling. If you have any questions, please contact Pestcon Systems, Inc., 5511 CAPITAL CENTER DRIVE, STE. 302, RALEIGH, NC 27606, TELEPHONE: (919) 859-2500 - FAX: (919) 859-2155

II. CHEMICAL AND PHYSICAL PROPERTIES OF FUMITOXIN® FUMIGANTS

FUMITOXIN® FUMIGANTS

- A. Chemical formula for hydrogen phosphide is PH_3 or H_3P .
- B. FUMITOXIN fumigant's active ingredient pure, finely ground aluminum phosphide, liberates hydrogen phosphide (phosphine) gas via the following chemical reaction

$$AlP + 3H_2O \rightarrow Al(OH)_3 + PH_3$$
- C. FUMITOXIN also contains ammonium carbamate which liberates ammonia and carbon dioxide as follows: $NH_2COONH_4 \rightarrow 2NH_3 + CO_2$. These gases are essentially nonflammable and act as inerting agents to reduce fire hazards. The pungent smelling ammonia gas serves as an initial warning agent, and begins to develop immediately upon opening.
- D. FUMITOXIN is prepared in the form of tablets, pellets and bags
- E. Upon exposure to air, FUMITOXIN tablets and pellets begin to react slowly with atmospheric moisture to produce small quantities of hydrogen phosphide (phosphine) gas. This reaction gradually accelerates and then tapers off again as the aluminum phosphide decomposes. Bags begin to release hydrogen phosphide (phosphine) gas immediately upon exposure to air.
- F. The rate of decomposition of the tablets, pellets, and bags varies depending on the moisture and temperature. For example, when moisture and temperature of the fumigated commodity are high, decomposition may be complete in less than 3 days. However, with ambient temperatures lower than 15 degrees C (60 degrees F), grain moisture lower than 10% or relative humidity lower than 25%, decomposition may require 5 days or more.
- G. The tablets weigh approximately 3 grams and release 1 gram of gaseous hydrogen phosphide. They are spherical in shape, approximately 5/8 of an inch in diameter and are packaged in bulk in resealable, seamless aluminum flasks which contain approximately 100 tablets, or larger flasks of approximately 500 tablets each
- H. Pellets are spherical in shape, approximately 3/8 of an inch in diameter, weigh approximately 0.6 grams, and release 0.2 grams of hydrogen phosphide. They are packaged in resealable aluminum flasks containing approximately 1,660 pellets or larger flasks containing approximately 2,490 pellets each.
- I. Bags are packaged in tins of 6, 10 or 100 bags each and in drums of foil pouches of 3, 6, and 10 bags per pouch for a total of 300 bags per drum. Each bag is approximately 3 inches by 3 inches and contains 34 grams of 55% aluminum phosphide. Bags release 11 grams of hydrogen phosphide when exposed to atmospheric conditions.
FUMITOXIN aluminum phosphide bags allow for the marketing of aluminum phosphide, ammonium carbamate and paraffin in granular form. The paper bag is an integral part of this concept and should never be torn open during fumigation. Once the hermetically sealed tins or the foil packaging is opened, the bags will begin to release hydrogen phosphide.
- J. After decomposition, FUMITOXIN leaves a grey-white powder composed almost entirely of non-poisonous aluminum hydroxide and a small amount of unreacted aluminum phosphide. This is not considered a hazardous waste. The slight trace of aluminum phosphide decomposes when raw commodities are moved. Following space fumigation and fumigations of processed foods, this powder may be disposed of as outlined in "Directions for Disposal of Spent Residual Dust"

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III. STORAGE OF FUMITOXIN ALUMINUM PHOSPHIDE PRODUCTS

- A. Store in a dry, well ventilated area, away from heat and under lock and key. Keep away from irresponsible people and children. Post as a pesticide storage area. Do not contaminate water, food or feed by storing pesticides in the same area used to store these commodities
- B. Do not store in buildings where humans or domestic animals reside.
- C. FUMITOXIN tablets and pellets are supplied in relatively gas tight resealable aluminum flasks. Do not expose the product to atmospheric moisture any longer than is necessary. Reseal tightly before returning flasks to storage; mark the flask opened and partially used
- D. FUMITOXIN bags that are supplied in tins are non-resealable and must be completely used when opened

FUMITOXIN bags that are supplied in metal drums do not have to be completely used as long as the bag is not removed from the foil pouch or the foil pouch is not opened. Remove the number of pouches required and reseal the metal drum.

- E. The shelf life of FUMITOXIN is virtually unlimited as long as the containers are kept tightly sealed

IV. PRECAUTIONARY STATEMENTS

A. Physical and Chemical Hazards

Aluminum phosphide tablets, pellets, bags, and partially spent dust will release hydrogen phosphide if exposed to moisture from the air or if it comes into contact with water, acids and many other liquids. Piling of tablets, pellets, bags or dust from their fragmentation may cause a temperature increase and confine the release of gas so that ignition could occur

It is recommended that you open aluminum phosphide products in open air or near a fan which exhausts outside immediately. Never open in a flammable atmosphere because on rare occasions it may flash. When opening, point the container away from the face and body. These precautions will also reduce the applicators exposure to hydrogen phosphide (phosphine) gas.

Pure hydrogen phosphide (phosphine) gas is practically insoluble in water, fats and oils, and is stable at normal fumigation temperatures. However, it may react with certain metals and cause corrosion, especially at higher temperatures and relative humidities.

Metals such as copper, brass, and other copper alloys, and precious metals such as gold and silver are susceptible to corrosion by phosphine, especially at high temperatures and humidity. Thus items such as small electric motors, smoke detectors, brass sprinkler heads, batteries and battery chargers, forklifts, temperature monitoring systems, electrical switch gear, communication devices, computers, calculators, watches, and other electronic equipment should be protected or removed before fumigation. Hydrogen phosphide will also react with certain metallic salts and, therefore, sensitive items such as photographic film, copying papers and some inorganic pigments, etc. should not be exposed

B. Hazards to Human and Domestic Animals

DANGER: FUMITOXIN tablets, pellets, bags or dust can be fatal if swallowed. Do not get in eyes, on skin or on clothing. Do not eat, drink or smoke while handling aluminum phosphide fumigants. When a sealed container is opened, allowing material to come in contact with moisture, water or acids, toxic phosphine gas will be released. If a garlic odor is detected refer to section on Industrial Hygiene Monitoring for appropriate monitoring procedures. Pure phosphine gas is odorless, the odor is due to a contaminant. Since an odor may not be detected under certain circumstances, the absence of garlic odor does not mean that phosphine gas is absent. Observe proper application, aeration, reentry and disposal procedures specified elsewhere in the labeling to prevent overexposure

C. Statement of Practical Treatment

Symptoms of overexposure are headache, dizziness, nausea, difficult breathing, vomiting, and diarrhea. In all cases of overexposure get medical attention immediately. Take victim to a doctor or emergency treatment facility

- 1. If excessive amounts of gas from aluminum phosphide are inhaled: Get exposed person to fresh air. Keep warm and make sure person can breathe freely. If breathing has stopped, give artificial respiration by mouth to mouth or other means of resuscitation. Do not give anything by mouth to an unconscious person
- 2. If aluminum phosphide pellets, tablets or powder are swallowed: Drink or administer one or two glasses of water and induce vomiting by touching back of throat with finger, or if available administer syrup of ipecac. Do not give anything by mouth if victim is unconscious or not alert.
- 3. If powder or granules of aluminum phosphide get on skin or clothing: Brush or shake material off clothes in a well ventilated area. Check that all pockets and cuffs are empty. Allow clothes to aerate in a ventilated area prior to laundering. Do not leave contaminated clothing in occupied and/or confined areas such as automobiles, vans, motel rooms, etc. Wash contaminated skin thoroughly with soap and water
- 4. If dust from pellets, tablets, or bags get in eyes: Flush with plenty of water. Get medical attention

V. SAFETY RECOMMENDATIONS

- 1. Carefully read all labeling and follow instructions explicitly.
- 2. Never work alone when applying fumigant from within an enclosed area
- 3. Never allow untrained personnel to apply FUMITOXIN® tablets, pellets or bags
- 4. It is preferable to open container in open air or near a fan that exhausts outside immediately. NEVER OPEN IN A FLAMMABLE ATMOSPHERE
- 5. Do not allow FUMITOXIN products or dust to contact liquid water or pile up
- 6. Dispose of empty container, spent bags, and spent residual dust, in a proper manner consistent with the label instructions.
- 7. Post "DANGER" signs on fumigated areas.
- 8. Notify appropriate company employees and provide relevant safety information to local officials annually for use in the event of an emergency.
- 9. Hydrogen phosphide fumigants are not to be used for vacuum fumigations
- 10. Exposure to hydrogen phosphide must not exceed the 8 hour TWA of 0.3 ppm during application or a maximum concentration of 0.3 ppm after application is completed. This includes re-entry into a structure.
- 11. Fumigated finished foods and feeds must be aerated 48 hours prior to offering to the end consumer.
- 12. Transfer of a treated commodity to another site without complete aeration (down to 0.3 ppm maximum) is permissible provided the new site is placarded.
- 13. Keep container sealed and intact until ready to begin applying fumigant
- 14. Use all bags from opened tins or foil pouches, drums can be resealed
- 15. OSHA recommends that exposure screening of employees be conducted to detect impaired pulmonary function. OSHA recommends that any employee developing the above condition be referred for medical attention
- 16. NIOSH/MSHA respiratory protection must be available at the site of application when applying fumigant from within an enclosed area. Respiratory protection need not be available for uses such as outdoor application
- 17. Wear dry gloves of cotton or other appropriate material when applying FUMITOXIN tablets and pellets
- 18. Do not fumigate when commodity temperature is below 40° F (5° C)
- 19. During transfer and processing of unaerated commodities, workers must not be exposed to levels of hydrogen phosphide above 0.3 ppm
- 20. It is recommended to aerate contaminated clothing in a well ventilated area prior to washing. Check that all pockets and cuffs are empty
- 21. Protect copper, silver, gold and their alloys from corrosive exposure to hydrogen phosphide.
- 22. Pellets, tablets, and/or bags, or their reacted residues must not come into contact with any processed food with the exception that both can be added directly to processed brewers rice, malt, and corn grits used in the manufacture of beer
- 23. Do not re-use aluminum phosphide containers for any purpose other than recycling or reconditioning.

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VI. RESPIRATORY PROTECTION

A. WHEN RESPIRATORY PROTECTION MUST BE WORN

NIOSH/MSHA approved respiratory protection must be worn during exposure to concentrations in excess of permitted limits or when concentrations are unknown.

B. PERMISSIBLE GAS CONCENTRATION RANGES FOR RESPIRATORY PROTECTION DEVICES

A NIOSH/MSHA approved, full face gas mask, hydrogen phosphide canister combination may be used at levels up to 15 ppm or to escape from levels up to 1500 ppm. Above this level or in situations where the hydrogen phosphide concentration is unknown, a NIOSH/MSHA approved, self-contained breathing apparatus (SCBA) or its equivalent must be used. The NIOSH/OSHA Pocket Guide, 8-85, DHEW/NIOSH 78-210, lists these and other types of approved respirators and the concentration limits of which they may be used.

C. REQUIREMENTS FOR AVAILABILITY OF RESPIRATORY PROTECTION

Respiratory protection must be available at the site of application in case it is needed when applying FUMITOXIN® tablets, pellets, and bags from within the structure being fumigated. An approved full face gas mask, phosphine canister combination or self-contained breathing apparatus (SCBA) or its equivalent must be available at the application site. If SCBA or its equivalent is not available at the application site, it must be available locally, for example, at a fire station or rescue squad.

Respiratory protection need not be available for applications from outside the area to be fumigated such as addition of tablets or pellets to automatic dispensing devices, etc., if exposures above the permitted limit will not be encountered.

Respiratory protection need not be available for outdoor applications.

C. If monitoring equipment is not available on a farm and application cannot be done from outside the structure, an approved canister respirator must be worn during application from within the enclosed indoor area.

VII. GAS DETECTION EQUIPMENT

There are several reliable devices marketed. One type is the hand pump when used in conjunction with appropriate detector tube. They are portable, simple devices and do not require intensive training or elaborate supporting equipment to operate. Furthermore, they are inexpensively adaptable to remote monitoring procedures and will measure concentrations of hydrogen phosphide in air in trace amounts or up. Use instructions are enclosed with each purchase. Consult your local supplier of such equipment or contact Pestcon Systems, Inc. for more information.

VIII. APPLICATOR AND WORKER EXPOSURE

A. HYDROGEN PHOSPHIDE EXPOSURE LIMITS

Exposure to hydrogen phosphide must not exceed the 8 hour TWA of 0.3 ppm for applicators and workers during application. Application is defined as the time period covering the opening of the first container, applying the appropriate dosage of fumigant and closing up the site to be fumigated. All persons in the treated site and in adjacent indoor areas are covered by this exposure standard.

After application is completed worker or applicator exposure must not exceed 0.3 ppm maximum concentration. Such exposures may occur because of leakage into enclosed areas from fumigation sites during reentry or during transfer of unaerated commodity.

B. APPLICATION OF FUMIGANT

Depending upon temperature and humidity, FUMITOXIN® tablets, pellets, and bags release hydrogen phosphide gas slowly upon exposure to moisture from the air. This release is often slow enough to permit applicator to deposit fumigant in the desired areas and then vacate the premises without significant exposure to the gas. If the fumigator's exposure exceeds the 8 hour TWA of 0.3 ppm, approved respiratory protection must be worn. Gas concentration measurements for safety purposes must be made using low level detector tubes or other suitable low level detection equipment. See the "Industrial

Hygiene Monitoring Section." Information on hydrogen phosphide (phosphine), PH₃ detector tubes may be obtained from Pestcon Systems, Inc.

C. LEAKAGE FROM FUMIGATED SITES

Hydrogen phosphide is highly mobile and given enough time may penetrate seemingly gas-tight materials such as concrete and cinder block. Therefore, adjacent, enclosed areas likely to be occupied should be examined to ensure that significant leakage has not occurred. Sealing of the fumigated site and/or air flow in the occupied areas must be sufficient to prevent exposures exceeding the TLV's.

D. AERATION AND REENTRY

If the area is to be entered after fumigation, it must be aerated until the level of hydrogen phosphide gas is 0.3 ppm or below. The area or site must be monitored to ensure that liberation of gas from the treated commodity does not result in the development of unacceptable levels of hydrogen phosphide. Do not allow reentry into treated areas by any person before this time unless protected by an approved respirator.

E. HANDLING UNAERATED COMMODITIES

Following the required exposure time for fumigation, transfer and processing of a treated commodity prior to complete aeration is permissible, however, workers must not be exposed to hydrogen phosphide in excess of the permitted exposure limits.

F. INDUSTRIAL HYGIENE MONITORING

It is recommended that hydrogen phosphide exposure be documented in an operation log or manual for each site and operation where exposure may occur. The purpose of this monitoring is to prevent excessive exposure and to determine when and where respiratory protection is required. Once exposures have been adequately characterized, subsequent monitoring is not routinely required. However, spot checks should be made occasionally, especially if conditions significantly change or if an unexpected garlic odor is detected. If monitoring shows that workers are exposed to concentrations in excess of the permitted exposure limits, then engineering controls (such as forced air ventilation) and/or appropriate work practices should be used where possible to reduce exposure below permitted limits.

IX. USE PATTERNS - INSECTS

Hydrogen Phosphide:

Hydrogen phosphide, more commonly referred to as phosphine, is a colorless gas which is toxic to insects, humans, and other forms of animal life. It is very mobile with a high vapor pressure. Thus, the penetrating capability of hydrogen phosphide is great. The combination of high molecular activity, vapor pressure and toxicity to insects at low dosages accounts for its wide acceptance as a fumigant.

FUMITOXIN has been found effective against the following stored products insects and their pre-adult stages — that is, eggs, larvae and pupae:

almond moth	flat grain beetle	pink bollworm
Angoumois grain moth	fruit fly	raisin moth
bean weevil	granary weevil	red flour beetle
cadelle	greater wax moth	rice weevil
cereal leaf beetle	hairy fungus beetle	pea weevil
cigarette beetle	hessian fly	rusty grain beetle
confused flour beetle	Indian meal moth	saw-toothed grain beetle
dermestid beetle	Khapra beetle	spider beetle
dried fruit beetle	lesser grain borer	tobacco moth
dried fruit moth	maize weevil	yellow meal worm
European grain moth	Mediterranean flour moth	Africanized and honeybee infested with tracheal mites

Although it is possible to achieve total control of the listed insect pests, this is frequently not realized in actual practice. Factors contributing to less than total control are leaks.

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poor gas distribution, unfavorable exposure conditions, etc. In addition, some insects are less susceptible to hydrogen phosphide than others. If maximum control is to be attainable, extreme care must be taken sealing, the higher dosages must be used, exposure periods lengthened, proper application procedures followed, and temperature and humidity conditions must be favorable.

X. COMMODITIES WHICH MAY BE FUMIGATED WITH FUMITOXIN® ALUMINUM PHOSPHIDE

FUMITOXIN may be used for the fumigation of listed raw agricultural commodities, animal feed and feed ingredients, processed foods, tobacco and certain other non-food items

A. Raw Agricultural Commodities:

- Almonds
- Animal Feed & Feed Ingredients
- Barley
- Brazil Nuts
- Cashews
- Cocoa Beans
- Coffee Beans
- Corn
- Cottonseed
- Dates
- Filberts
- Flower Seed
- Grass Seed
- Millet
- Oats
- Peanuts
- Pecans
- Pistachio Nuts
- Popcorn
- Rice
- Rye
- Safflower Seed
- Sesame Seed
- Seed & Pod Vegetables
- Sorghum
- Soybeans
- Sunflower Seeds
- Triticale
- Vegetable Seed
- Walnuts
- Wheat

B. Processed Foods:

The listed processed foods may be fumigated with FUMITOXIN. Under no conditions shall any processed foods or bagged commodity come into contact with tablets, pellets or other residual dust from bags except that FUMITOXIN may be added directly to processed brewers rice, malt and corn grits for use in the manufacture of beer

- Processed candy and sugar
- Cereal flours and bakery mixes
- Cereal foods (including cookies, crackers, macaroni, noodles, pasta, pretzels, snack foods and spaghetti)
- Processed cereals (including milled fractions and packaged cereals)
- Cheese and cheese by-products
- Chocolate and chocolate products (assorted chocolate, chocolate liqueur, cocoa, cocoa powder, dark chocolate coating and milk products)
- Processed coffee
- Corn grits
- Cured, dried and processed meat products and dried fish
- Dates
- Dried eggs and egg yolk solids
- Dried milk, dried powdered milk, nondairy creamers
- Dried or dehydrated fruits (apples, dates, figs, peaches, prunes, raisins, and sultanas)
- Eggs
- Malt
- Peanuts
- Processed herbs, spices, seasonings and condiments
- Processed nuts (almonds, apricot kernels, brazil nuts, cashews, filberts, pecans, pistachio nuts and walnuts)
- Processed Oats

- Rice (brewers rice grits, enriched and polished wild rice)
- Soybean flour and milled fractions
- Processed Tea
- Dried and dehydrated vegetables (beans, carrots, lentils, peas, potato flour, potato products and spinach)
- Yeast (including primary yeast)
- Wild Rice

C. Animal Feed and Feed Ingredients:

FUMITOXIN may be added directly to animal feed, feed ingredients and raw agricultural commodities stored in bulk. For those commodities not stored in bulk, tablets or pellets may be placed in moisture permeable envelopes or placed on trays, etc. or bags may be used, following directions as with processed foods

D. Nonfood Products:

- Animal Hide
- Clothing
- Processed or unprocessed cotton, wool and other natural fibers or cloth
- Feathers
- Furs
- Human hair, rubberized hair, vulcanized hair, mohair
- Leather Products
- Tobacco
- Wood, cut trees, wood chips and wood and bamboo products
- Paper and paper products
- Dried plants and flowers
- Seed (grass seed, or ornamental herbaceous plant seed, and vegetable seed)
- Straw or hay

XI. FUMIGATION EXPOSURE GUIDELINE

The following table may be used as a guide in determining the minimum length of the exposure period at the indicated temperatures:

A. TEMPERATURES/EXPOSURE PERIOD

TEMPERATURE TO WHICH FUMIGANT AND INSECTS ARE EXPOSED	MINIMUM EXPOSURE PERIOD FOR FUMIGATION		
	PELLETS	TABLETS	BAGS
Below 40° F (5° C)	Do not fumigate	Do not fumigate	Do not fumigate
40° - 53° F (4-12° C)	8 days (192 hours)	10 days (240 hours)	14 days (336 hours)
54° - 59° F (12-15° C)	4 days (96 hours)	5 days (120 hours)	9 days (216 hours)
60° - 68° F (16-20° C)	3 days (72 hours)	4 days (96 hours)	5 days (120 hours)
Above 68° F (20° C)	2 days (48 hours)	3 days (72 hours)	3 days (72 hours)

The length of the fumigation must be long enough so as to provide for adequate control of the insect pests which infest the commodity being treated. It will be necessary to lengthen the fumigation at lower temperatures and relative humidities (or grain moisture) since insects are more difficult to control under these conditions

The fumigation period should also be long enough so that the generation of hydrogen phosphide gas has essentially ceased and worker exposure minimized during further storage and/or processing.

There is little to be gained by extending the exposure period if the structure to be fumigated has not been carefully sealed. This is required to insure that adequate gas levels are retained. Proper application procedures must be followed to provide satisfactory distribution, retention and results

The exposure periods in the above table are minimum periods and should not be shortened for any reason other than when it may be necessary to abort the fumigation

FUMITOXIN may be placed in moisture permeable envelopes on trays, etc., and fumigated as with processed foods.

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XII. RECOMMENDED DOSAGE RATES

A. GENERAL

The successful conclusion of a fumigation depends on the concentration being held for a sufficient length of time or exposure period. With hydrogen phosphide, minimum exposure times are required because of the means of generating the gas from solid material and the biological action of the insect. For successful results against all stages, exposure times are not generally possible in less than 48 hours.

It is beyond the scope of this brochure to take into account all conditions prevailing in all situations where FUMITOXIN® is used. Construction and tightness of storages vary considerably, so do climatic conditions. Therefore, we can only give a general guidance, which explains the wide range of the following recommended dosage rates.

Dosage rate depends primarily upon the following factors:

- Type of storage
- Pests to be controlled
- Commodity temperature

Dosage is calculated per 1,000 cubic feet or per 1,000 bushels.

PRODUCT	PER 1,000 CU. FT.	PER 1,000 BUSHELS
Pellets	100-500	125-625
Tablets	20-145	25-180
Bags	2-13	

These dosages are not to be exceeded. It is important to be aware that a shortened exposure period cannot be compensated by an increased dosage of hydrogen phosphide.

Long fumigation experience has shown the following recommendations to be generally reliable. Extremely adverse conditions may require deviation from these recommended dosage rates. Contact your Pestcon Systems, Inc. representative for assistance.

B. SPECIFIC

Recommended dosages for several types of fumigations: It is permissible to choose from the full range of dosages listed, however, these dosages should not be exceeded. Remember, a shortened exposure period **cannot** be compensated for with an increased dosage. The upper dosages listed are recommended in structures that are of loose construction and in bulk stored commodities.

TYPE OF STORAGE	RECOMMENDED DOSAGE
1. TABLETS/PELLETS	
a. Silos	
Large vertical silo bins which are relatively gas tight (e.g., steel), or well constructed concrete bins	40-180 tablets per 1,000 bushels 120-300 pellets per 1,000 bushels (When distributed by automatic dispenser)
b. Farm Bins, Butler Type, well constructed and reasonably gas tight	90-180 tablets per 1,000 bushels 200-600 pellets per 1,000 bushels
Farm bins made of wood or loosely constructed metal are rather untight, even a considerable increase in dosage may not give complete kill. Such structures should be covered with polyethylene sheeting, permitting the dosage to be considerably reduced.	
c. Bulk stored commodities in flat stores, steel bins, bunkers, etc.	90-180 tablets per 1,000 bushels 270-540 pellets per 1,000 bushels
d. Loosely piled commodity stored under temporary, relatively gas tight covering	90-180 tablets per 1,000 bushels 270-540 pellets per 1,000 bushels
e. Packaged commodities (bagged grain, processed foods, etc.) in sealable enclosure	30-90 tablets per 1,000 cubic feet 185-300 pellets per 1,000 cubic feet

TYPE OF STORAGE	RECOMMENDED DOSAGE
f. Nuts or dates in bags or storage boxes	20-40 tablets per 1,000 cubic feet 100-200 pellets per 1,000 cubic feet
g. Nuts or dates in bulk	30-40 tablets per 1,000 cubic feet 150-200 pellets per 1,000 cubic feet
h. Railcars	45-145 tablets per 1,000 cubic feet 225-500 pellets per 1,000 cubic feet
i. Space fumigation such as cereal mills, feed mills, food processing plants & warehouses	20-45 tablets per 1,000 cubic feet 100-225 pellets per 1,000 cubic feet
j. Stored tobacco	20-40 tablets per 1,000 cubic feet 100-165 pellets per 1,000 cubic feet
k. Non-food products	30-90 tablets per 1,000 cubic feet 150-450 pellets per 1,000 cubic feet
l. Stored beehives, supers and other beekeeping equipment for wax moth control and Africanized honeybees infested with tracheal mites and foulbrood	30-45 tablets per 1,000 cubic feet 150-225 pellets per 1,000 cubic feet
m. Rodent burrows	2-4 tablets per burrow 10-20 pellets per burrow
n. Shipholds	30-60 tablets per 1,000 cubic feet - BULK 30-60 tablets per 1,000 cubic feet - BAGGED 165-300 pellets per 1,000 cubic feet - BULK 100-300 pellets per 1,000 cubic feet - BAGGED
o. Spices in small containers	1-2 pellets per 10 cubic feet

2. BAGS

TYPE OF STORAGE	RECOMMENDED DOSAGE PER 1000 CU. FT.
1. Space (including packaged commodities)	
a. Mills, Warehouses, etc.	2-6
b. Bagged Commodities	3-6
c. Dried Fruits, Nuts & Dates	2-4
d. Stored Tobacco	2-4
2. Bulk Stored Commodities	
a. Vertical Storage	3-5
b. Tanks	4-6
c. Flat Storage (loose construction)	5-13
d. Farm Bins	6-13
e. Rail Cars	3-6
f. Bunkers, Tarped Ground Storage	3-6
g. Barges	3-7
h. Shipholds	3-6

NOTE: The maximum dosage allowed for dates, nuts and dried fruits is 4 bags per 1000 cu. ft.

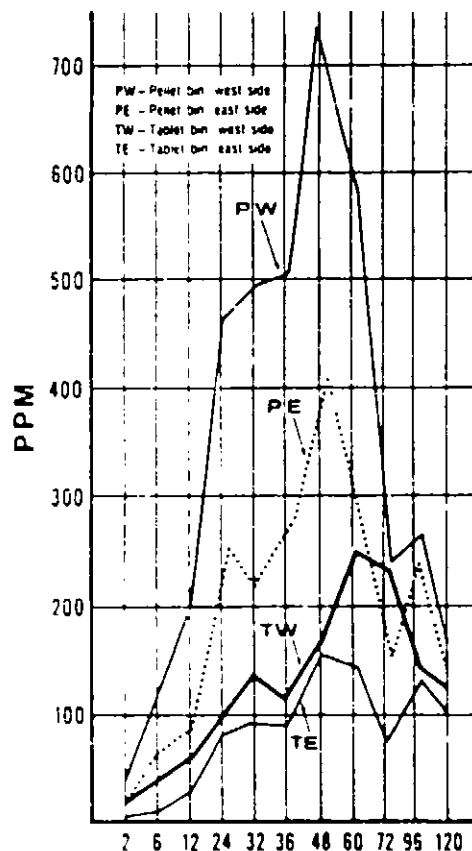
The wide range of dosages listed above is required to handle the variety of fumigation situations encountered in practice. Somewhat higher dosages are usually recommended under cooler, drier conditions where exposure periods are relatively short. However, the major factor in selection of dosage is the ability of the structure to hold hydrogen phosphide gas during the fumigation. A good illustration of this point is comparison of the low dosages required to treat modern, well-sealed warehouses with the higher range used for poorly constructed buildings that cannot be sealed adequately.

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XIII. USING TABLETS OR PELLETS

The question often is asked why there may be a difference in the total amount of aluminum phosphide in dosage recommendations between tablets and pellets. Contrary to what might be expected, it is not always the best decision to assume that you use five times as many pellets (which weigh 0.6 grams each) as tablets (which weigh 3 grams each). Because they are smaller, pellets decompose more quickly and almost always give a higher peak concentration much sooner than tablets. Often you have a different distribution pattern. These and other factors thus suggest there often will be a difference in dosage rates between tablets and pellets.

To illustrate this, the following chart summarizes the results of a test fumigation of two bins of identical size, one treated with 22 tablets (66 grams) per 1,000 bushels and the other treated with 110 pellets (66 grams) per 1,000 bushels. The results show a clear difference in the amount of gas available and the concentration reached using identical weights of aluminum phosphide. Peak concentration of the pellet treated bins were over three times that of the tablet treated bin (770 ppm vs 230 ppm). For warehouse and flat storage buildings, tablets often (but not always) are the preferred choice.



XIV. DIRECTIONS FOR USE - GENERAL

1. It is a violation of federal law to use this product in a manner inconsistent with its labeling.
2. FUMITOXIN® tablets, pellets, and bags are Restricted Use Pesticides due to the acute inhalation toxicity of hydrogen phosphide (phosphine, PH₃) gas.
3. FUMITOXIN is a highly hazardous material and may be used only by individuals trained in its proper use. Before using, read and follow all label precautions and directions on the label and in labeling. Additional copies of this Manual are available from.

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4. At least two trained persons must be present when FUMITOXIN pellets, tablets, and bags are applied from within the enclosed indoor area being treated or during reentry into a fumigated or partially aerated site. Only one trained person is required to be present when the fumigant is applied from outside the area being fumigated.
5. Prior to applying this product you should determine (1) if the structure can be made sufficiently gas tight, (2) if recording of gas readings will be required, (3) how to efficiently and safely apply the fumigant and (4) emergency procedures.
6. Shipholds, barges, containers on ships, railroad cars and containers shipped piggy-back by rail may be fumigated intransit. However, fumigated trucks, vans, trailers and similar transport vehicles shall not be moved over public roads or highways until they are aerated.
7. Do not fumigate commodities with this product when commodity temperature is below 40° F (5° C).
8. Wear gloves of cotton or other suitable material while handling FUMITOXIN® tablets, pellets, or dust from bags. Wash hands thoroughly after use.
9. Hydrogen phosphide gas may flash at concentrations above its flammable limit. Therefore, always open FUMITOXIN containers in outdoor air and never in a flammable atmosphere. This precaution will not only prevent harm in the unlikely event of a flash but will reduce the applicator's exposure to hydrogen phosphide gas.
10. Piling of tablets, pellets, bags or dust from their fragmentation, or addition of liquid water to FUMITOXIN may cause a temperature increase and confine the release of gas so that ignition could occur.
11. As much as possible, protect unused FUMITOXIN from excessive exposure to atmospheric moisture during application. Tightly reseal and mark the tablet or pellet aluminum flask as opened and partially used prior to returning to storage. Do not reseal tin bag containers. However, metal drums holding the foil pouch packages of bags can be resealed as long as the foil pouches are still intact.
12. Respiratory protection approved for the concentration to which the fumigator will be exposed must be available if FUMITOXIN is to be applied from within an enclosed indoor area. Respiratory protection need not be available for uses such as outdoor application, addition of tablets or pellets to automatic dispensing devices, etc., if exposures above the TLV's will not be encountered. A NIOSH/MSHA approved, full-face gas mask — hydrogen phosphide canister combination may be used at levels up to 15 ppm. Above this level or in situations where the hydrogen phosphide concentration is unknown, a NIOSH/MSHA approved, self-contained breathing apparatus (SCBA) or its equivalent must be used.
13. Notify appropriate company employees and provide relevant safety information to local officials annually for use in the event of an emergency.
14. Tablets, pellets, or the powder in bags must not come into contact with any processed food with the exception that it can be added directly to **processed brewers rice, malt and corn grits used in the manufacture of beer**.
15. Protect copper, silver, gold and their alloys from corrosive exposure to hydrogen phosphide.

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XV. DIRECTIONS FOR USE - SPECIFIC

A. TABLETS AND PELLETS

1. FARM STORAGE FUMIGATION

a. Equipment Necessary:

- 1 FUMITOXIN® tablets, pellets
- 2 5' to 7' probes, 1 1/4" diameter, PVC rigid tubing is recommended.
- 3 Grain sampling probe with pan, screen and thermometer (optional).
- 4 Gloves of cotton or other appropriate material (washable).
- 5 Aluminum phosphide warning signs.
- 6 Polyethylene sheeting
- 7 Detection equipment
- 8 Approved respiratory protection equipment.

b. Steps in FUMITOXIN Fumigation:

- 1 Contact your supplier for detailed information, assistance and training outlines.
- 2 **Read the label on the container** and all supplemental labeling.
- 3 Determine location of infestation
- 4 Determine number of bushels to be treated
- 5 Determine number of tablets/pellets required for treatment as follows

DOSAGE CHART

TYPE OF STORAGE	GRAIN TEMP.	TABLET DOSAGE PER 1,000 BUSHELS	PELLET DOSAGE PER 1,000 BUSHELS
Concrete elevators or steel tanks with turning facilities	60-68° F Over 68° F	90-180 tablets 60-90 tablets as grain is being turned	200-450 pellets 150-450 pellets
Round steel bins	60-68° F Over 68° F	120 tablets 90 tablets	200-450 pellets 150-450 pellets
Flat stores in relative tight building not over 30 feet in depth	60-68° F Over 68° F	150 tablets 120 tablets	150-450 pellets 150-450 pellets
Treatment of partial bins		120-180 tablets	150-450 pellets

- 6 Plan the distribution pattern for applying the tablets/pellets (keep in mind location of infestation). Contact your supplier for information on equipment to probe deeper than seven feet if this is necessary
- 7 Probe tablets on 4 centers. Probe all tablets/pellets as deeply as possible, particularly with warm grain in cool climates. Convectional currents can prevent the hydrogen phosphide (phosphine) from penetrating downward
- 8 Place warning signs by all access openings
- 9 It is recommended that the perimeter of the bin be sprayed at ground level with an approved insecticide to help prevent reinfestation
- 10 Do not enter the building for a minimum of five days after the fumigant has been applied or longer if grain is cooler than 60° F. Do not fumigate when grain temperature is below 40° F
- 11 Following aeration of the building, spray grain surface with approved insecticide to discourage surface reinfestation

NOTE: If monitoring equipment is not available on a farm and application cannot be done from outside of a structure, an approved canister respirator must be worn during application from within an enclosed indoor area

2. FUMIGATING VERTICAL STORAGE (Concrete upright bins, silos, etc.)

- a. Locate all ventilation facilities for basement/tunnel.
- b. Check commodity temperature and moisture and determine required exposure time.
- c. To the extent possible, seal all openings except for fill opening.
- d. Calculate number of tablets or pellets required based on quantity (bushels) of commodity to be treated.
- e. Open containers in open air or near a fan which exhausts outside immediately as under certain conditions containers of aluminum phosphide may flash upon opening.
- f. Tablets or pellets may be applied by hand or with an automatic dispenser to the moving grain stream. Bins requiring more than 24 hours to fill should not be fumigated by direct addition as the bin is filled. These bins should be fumigated upon completion of filling by probing.
- g. Warning signs should be placed on hatch cover and discharge spout of each treated bin
- h. Employees may continue with their normal duties when FUMITOXIN fumigant is used to fumigate grain in concrete elevator bins, providing proper exposure levels are maintained.
- i. Following application, basement/tunnels should always be checked for gas concentration before work starts. This can be done with detector tubes. If a concentration is detected in the basement/tunnel, it must be eliminated by natural or forced ventilation. Checking of headhouse/gallery and basement/tunnel should always be done before the elevator crews start work. Grain must not be removed prior to completion of minimum exposure time.

3. FUMIGATION OF FLAT STORAGE (Bunkers, Quonset Buildings, Large Steel Tanks, etc.)

- Structures shall not be occupied during fumigation. If the storage is within a barn, all animals must be removed for the entire period of fumigation.
- a. Check the storage for tightness.
 - b. To the extent practical seal any vents, cracks or other leaks
 - c. Determine commodity temperature, moisture and type of application to be made
 - d. Determine the dosage and exposure time based on the above information
 - e. Tablets are recommended for flat storage, but if necessary, pellets may be substituted. Workers should be aware of the much shortened allowable application time if pellets are used.
 - f. Apply tablets by using probes. Probes should be inserted at three or four foot intervals horizontally in both directions. The number of tablets per probe is determined by dividing the total number of tablets by the total number of probings to be carried out. Tablets will be dropped into the probes at intervals, as the probe is withdrawn
 - g. During application of the tablets, doors and windows shall be open to create as much cross ventilation as possible. Observe proper exposure levels and proper respiratory protection requirements found elsewhere in this manual
 - h. Covering the surface of the commodity with tarps or plastic sheets reduces convectional currents and gas loss, thus increasing the effectiveness of the fumigant. This cover must be removed after the fumigation is completed
 - i. On completion of FUMITOXIN® application and covering of commodity with tarps, close, seal and secure all doors, windows, hatches, etc.
 - j. Warning signs are placed on all doors and openings so they are visible from all directions.
 - k. After full exposure time, aerating can be accomplished by opening doors and windows from the outside and allowing a cross draft until the area is suitable for re-entry. If the enclosure must be entered to open doors and windows, two or more persons must work together wearing proper respiratory equipment. Presence of hydrogen phosphide must be determined with detector tubes. Refer to aeration, re-entry and industrial hygiene monitoring sections found elsewhere in this document

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4. TRUCKS, VANS, CHAMBERS, CONTAINERS, AND OTHER TRANSPORT VEHICLES

- a Determine if the truck, van, chamber, container, or other transport vehicle can be made relatively gas tight
 - b Determine the volume of space to be fumigated
 - c Determine the proper dosage and exposure time.
 - d Seal any vents, cracks or other leaks
 - e For raw agricultural commodities aluminum phosphide may be added directly to the raw commodity as it is loaded, or probed in after loading is completed.
 - f The fumigation of processed foods in trucks, vans, containers, and other transport vehicles must be done in such a manner as to prevent contact of aluminum phosphide with the commodity or its packaging.
 - g All doors and other openings are then sealed to prevent gas loss.
 - h After doors and other openings are closed and resealed, warning signs are placed on all of these doors or openings. Refer to placarding instructions for sign requirements.
- Trucks, vans, chambers, containers and other transport vehicles to be placed aboard vessels or on piggyback rail shipments may be fumigated in-transit, but must not be moved, while under fumigation, over public roads or highways when moved to the rail site or vessel for loading

5. FUMIGATION IN SMALL SEALABLE ENCLOSURES

- a Determine that the small sealable enclosures can be made relatively gas tight
- b Place the tablets or pellets in the space to be fumigated. Never pile pellets or tablets on top of each other
- c Secure the structure in such a way as to prevent gas loss
- d Post warning signs on all sides of the structure
- e If the structure is properly sealed, workers need not vacate the premises. However, you must observe proper exposure levels found elsewhere in this manual
- f Maintain good cross ventilation during working hours
- g Observe proper exposure procedures
- h Spices stored in relatively air tight drums or other small containers can be fumigated by placing the pellets in moisture permeable envelopes inside the drum, in such a manner as to keep pellets, as well as the residue, from coming into contact with the spices. Drums or small containers should be stored in an area that is clearly marked so as to provide for worker safety under the proper exposure limits. Following the fumigation, the drum or small container must be aerated prior to shipment. The residue should be disposed of according to proper procedures

6. PROCEDURES FOR FUMIGATION OF SPACE IN MILLS, WAREHOUSES AND OTHER STRUCTURES

- a Determine the dosage of tablets or pellets to be applied based upon the following parameters for space fumigation
 - 1 The volume of the structure
 - 2 The air and/or commodity temperature
 - 3 The general tightness of the structure to be fumigated.
- b Carefully seal the area to be fumigated
- c Place trays or sheets of Kraft paper, up to 12 sq ft in area, on the floor of the structure to hold the tablets or pellets
- d Spread tablets or pellets on the sheets at a density no greater than 30 tablets per sq ft or 75 pellets per sq ft. This corresponds to slightly more than one-half flask of tablets or one-half flask of pellets per 3' x 4' sheet
- e Check the sheet to see that aluminum phosphide has not been piled up and that it is dispersed evenly to minimize contact between the individual tablets or pellets
- f Doors leading to the fumigated space are then closed, sealed and **locked**. Aluminum phosphide warning signs must be placed on all entrances. Refer to the placarding instructions found elsewhere in this manual
- g The fumigation period usually lasts from 2 to 5 days, depending upon the temperature. Do not fumigate when the temperature of the commodity or the space within the structure is below 40° F (5° C). Consult the label and other labeling for further information.
- h Upon completion of the exposure period, windows and doors should be opened and the fumigated structure allowed to aerate. Gas concentration readings must be taken using low level detector tubes before allowing personnel to re-enter the area. Refer to aeration,

- re-entry and industrial hygiene monitoring sections found elsewhere in this document
- i. Spent residue dust remaining after the fumigation is disposed of as described in disposal procedures found elsewhere in this manual.

7. BARGE FUMIGATION DIRECTIONS

- a. Determine barge is suitable for fumigation.
- b. Determine barge is dry and clean.
- c. Determine that lids and hatch covers are in good order and can be secured
- d. 1. **Bulk Commodities** can be treated as follows:
 - By placing tablets or pellets into the stream as the commodity is being loaded on the barge.
 - Or, after completion of loading fumigate by using directions for land based structures inserting the pellets and tablets below the surface with proes
- 2. **Bagged or Other Packaged Commodities** can be treated as follows
 - Upon completion of loading, apply tablets or pellets in a manner consistent with other bagged or packaged fumigation directions in land based structures
- e. Close and secure covers.
- f. Post appropriate warning signs to include ballast tank openings as well as cargo area
- g. Notify consignee the commodity is under fumigation.
- h. Prior to unloading barges make appropriate test to ascertain cargo area as well as ballast areas are free of hydrogen phosphide gas

NOTE: Barge fumigation is regulated by U.S. Coast Guard Regulations 46 CFR 147A as modified by U.S. Coast Guard Special Permit 2-75. The shipper or fumigator must possess this permit prior to fumigating. To obtain this permit contact:

U.S. Coast Guard
Hazardous Material Branch
Washington, D.C. 20593-0001

8. RAILCAR FUMIGATION

Bulk Raw Commodities and Processed Brewers Rice, Malt and Corn Grits

- a Determine proper dosage and exposure time
- b Seal any vents, cracks or other leaks
- c. For raw agricultural commodities aluminum phosphide may be added directly to the commodity as it is loaded, or probed in after loading is completed. Probing is easily done by using a 5' x 7' section of rigid PVC tubing that is 1 1/4" in diameter. Tablets or pellets are dropped through the tube as it is withdrawn from the commodity
- d. All doors and hatch covers are then sealed with tape to prevent gas loss
- e. After the doors or hatch covers are closed and sealed, warning signs are placed on the top and sides of the car as required by law. Refer to placarding instructions for sign requirements.
- f. Notify the consignee that the railcar has been fumigated

Processed Food

- a. Volume of space is first determined
- b Determine proper dosage and exposure time
- c. Seal any vents, cracks or other leaks
- d. The fumigation of processed food in railcars must be done in such a manner as to prevent contact of aluminum phosphide or its residual dust with the commodity or its packaging.
- e. Tablets or pellets may be placed in moisture permeable material and then fastened to substantial supports in order to prevent contamination during rail car movement.
- f All doors and hatch covers are then sealed with tape to prevent gas loss
- g After the doors or hatch covers are closed and sealed, warning signs are placed on the top and sides of the car as required by law. Refer to placarding instructions for sign requirements
- h. Notify the consignee that the railcar has been fumigated

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9. TREATMENT OF BEEHIVES, SUPERS AND OTHER BEEKEEPING EQUIPMENT
FUMITOXIN® tablets and pellets may be used for the control of the greater wax moth in stored beehives, supers and other beekeeping equipment and for the destruction of bees. Africanized bees and diseased bees, including those infested with tracheal mites and foulbrood. The recommended dosage for this use is 30-45 tablets or 150-225 pellets per 1,000 cubic feet.

Fumigations may be performed in chambers at atmospheric pressure under tarpaulins, etc., by placing the tablets or pellets on trays or in moisture permeable envelopes. Do not add more than 2 tablets or 10 pellets to each envelope. Evenly distribute the envelopes inside the fumigation enclosure, or by placing the tablets or pellets on trays and placing the trays inside the fumigation chamber. Honey from treated hives or supers may only be used for bee food.

10. FUMI-SLEEVE® DUST RETAINER METHOD OF FUMIGATION—PATENT NO. 4,579,417 AND 4,641,573

The presence of residue from FUMITOXIN® tablets or pellets in treated raw agricultural commodities normally presents no problems of toxicity or sanitation. Nevertheless, where it is specified no tablets or pellets can be placed directly into the commodity during fumigation, conduct the fumigation in the normal manner following the directions below:

1. Determine the structure can be made relatively tight by sealing all vents, windows, cracks or other openings.
2. Determine the dosage and appropriate number of probings to be used.
3. The FUMI-SLEEVE dust retainer is slipped over the standard 1 1/4" PVC probe.
4. The probe with dust retainer is then inserted into the commodity.
5. As the probe is **withdrawn**, leaving the dust retainer in the commodity the appropriate number of tablets or pellets are poured into the probe.
6. After the probe is completely removed, leaving the dust retainer containing the tablets or pellets in the commodity, tie off the top of the retainer in a common overhand knot.
7. Post the structure (shiphold, barge, container on the ship, railcar, other piggyback structure) with appropriate warning signs as well as a sign showing the number of FUMI-SLEEVE dust retainers used.
8. On completion of fumigation remove all retainers from the treated commodity and transport in a well ventilated container to disposal site.
9. Disposal
 - a. Complete dust retainer and residue can be buried.
 - b. Although it is not recommended, if the FUMI-SLEEVE dust retainer is to be used again, it should be opened, the residue emptied out and buried. The empty dust retainer should be washed and completely dried before re-use.

11. RODENT BURROW — FOR CONTROL OF BURROWING RODENTS AND MOLES
Environmental Hazards

This product is very highly toxic to wildlife. Non-target organisms exposed to phosphine gas in burrows will be killed. Do not apply directly to water or wetlands (swamps, bogs, marshes, and potholes) Do not contaminate water by cleaning of equipment or disposal of wastes.

It is a violation of Federal Law to use this product in a manner inconsistent with its labelling.

This fumigant is a highly hazardous material and should be used only by individuals trained in its proper use. Before using read and follow all label precautions and directions.

FOR CONTROL OF THE FOLLOWING RODENTS AND MOLES: Marmot sp. - - - Woodchucks and Yellow Belly marmots (Rockchuck), Prairie Dogs (except Utah Prairie Dogs), Norway and Roof Rats, House Mice, Ground Squirrels, Moles, Voles, Gophers, and Chipmunks.

Directions for use against burrowing pests: Add from 2 to 4 tablets or 10 to 20 pellets to the burrow. Seal tightly by shoveling soil over the entrance after first packing the opening with crumpled newspaper. This will prevent soil from covering the tablets or pellets and slowing down their action. Use lower rates in smaller burrows when soil moisture conditions are high and higher rates in larger burrows when soil moisture is low. Treat re-opened burrows a second time 1 to 2 days after the initial treatment. For use on non-crop areas, crop areas and orchards

OUTDOOR USE ONLY. Do not use within 15 feet (5 meters) of inhabited structures. Do not apply to burrow which may open under or into occupied buildings. Please consult Local, State and Federal Game Authorities to ensure that endangered species do not inhabit the area proposed for treatment

ENDANGERED SPECIES CONSIDERATIONS

The use of any pesticide in a manner that may kill or otherwise harm an endangered or threatened or adversely modify their habitat is a violation of federal laws. The use of this product is controlled to prevent death or harm to endangered or threatened species that occur in the following counties or elsewhere in their range:

STATE (REGIONAL OFFICE FWS) Species	COUNTY (UNLESS SPECIFIED)	
ARIZONA (ALBUQUERQUE, N.M.) Black-footed ferret	STATEWIDE	
CALIFORNIA (PORTLAND, OR) San Joaquin Kit-Fox	KERN. KINGS TULARE FRESNO VENTURA	MERCED MONTEREY SAN BENITO SAN LUIS OBISPO SANTA BARBARA
Blunt-nosed Leopard Lizard	KERN KINGS FRESNO	MADERA MERCED TULARE
COLORADO (DENVER, CO) Black-footed ferret	STATEWIDE	
FLORIDA (ATLANTA, GA) Eastern Indigo Snake	STATEWIDE	
GEORGIA (ATLANTA, GA) Eastern Indigo Snake	STATEWIDE	
KANSAS (DENVER, CO) Black-footed ferret	STATEWIDE	
MONTANA (DENVER, CO) Black-footed ferret	STATEWIDE	
NEBRASKA (DENVER, CO) Black-footed ferret	STATEWIDE	
NEW MEXICO (ALBUQUERQUE, NM) Black-footed ferret	STATEWIDE	
NORTH DAKOTA (DENVER, CO) Black-footed ferret	STATEWIDE	
OKLAHOMA (ALBUQUERQUE, NM) Black-footed ferret	STATEWIDE	
SOUTH DAKOTA (DENVER, CO) Black-footed ferret	STATEWIDE	
TEXAS (ALBUQUERQUE, NM) Black-footed ferret	STATEWIDE	
UTAH (DENVER, CO) Desert Tortoise Black-footed ferret	WASHINGTON	STATEWIDE
WYOMING (DENVER, CO) Black-footed ferret	STATEWIDE	

Use of this product in the above areas is prohibited without first contacting and obtaining permission from the Endangered Species Specialist in the regional offices of the U.S. Fish and Wildlife Services (FWS) nearest you.

SPECIAL LOCAL RESTRICTIONS ON THE USE OF FUMITOXIN® TABLETS AND PELLETS FOR CONTROL OF BURROWING PESTS

NORTH CAROLINA
 FUMITOXIN tablets and pellets may only be used for control of rats, mice and voles in the state of North Carolina. Use against other pests is not permitted

MISSOURI
 "A state permit is required for use of pesticides in Missouri to control small mammals, except rats or mice. Please contact the Missouri Department of Conservation office for information."

KANSAS
 "A special permit to black-tailed prairie dog control by poisoning is required in Kansas. Contact the Kansas Fish and Game Commission to obtain this permit."